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British Carbide Production

THE chemical industry feels strongly that the general and rather nebulous reasons put forward by many of the speakers in the recent Parliamentary debate on the Caledonian Power Bill should not be allowed to interfere with the establishment of a home carbide industry on an economic basis. There is throughout the world an enormous overproduction of calcium carbide which, in the words of an authority upon the subject, "has made this industry one of the least remunerative branches of modern industry." At the present time carbide is made in Norway, where water power is cheap, at a cost of 25s. per ton, according to Sir Geoffrey Ellis (Parliamentary debate). According to the promoters of the Bill, the power cost if the factory were to be situated in South Wales, would be 22s. 6d. a ton more than if it were at Corpach. Since the intention is that the factory should be privately owned, the paramount consideration in choosing the site must be the necessity of making a return upon the capital invested.

It is well that the chemical industry should be in possession of the salient facts of the situation. The primary reasons for rejection given by the opponents of the Bill—reasons which weighed sufficiently with the House to cause the rejection—were for the most part of a very general character and unsupported by definite figures. It was urged that private property should not be compulsorily expropriated for private profit, as must be done if the power scheme were to be proceeded with—even though adequate compensation were given; that no special rating relief should be given for an initial period to assist the inception of the new venture—even though the coal industry and other ventures are and have been helped by public subsidies in one form or another, and though (*vide* Sir Archibald Sinclair) "the rating concession is only for the period of development and the Inverness County Council has willingly given that concession"; that large numbers of people would be sent into an area which was stated not to be depressed (though this was denied by the supporters of the Bill) so that the industry should be situated in a depressed area where it would be more useful; and that water power should not be developed when the collieries are anxious to sell coal. The further point was made that the proposal to establish a water power station would divert the waters that flow past Inverness so that this city would be deprived of 15 per cent. of its annual water supply.

The crux of the situation is this: Should the industry be situated in a depressed area; where can it be best situated; and should coal or water power be used? It has already been made clear that the enterprise must be financially sound and this fact was

further emphasised when the Secretary of State for Scotland stated specifically that there was no promise whatever of any duty or any subsidy on the part of the Government. So far as numbers of men employed are concerned, a carbide factory of adequate size and of modern design is not a great employer of labour. Without having absolute figures upon which to base our belief, it seems likely that the whole 60,000 tons of carbide could be produced annually by the efforts of not more than 400 men at the factory. Since some considerable temporary alleviation of rates would be necessary, it does not appear that the establishment of such a factory would materially assist a depressed area from this point of view. We are driven to the conclusion that on every ground, the guiding principle must be the cost of production.

The factors that must be considered, placed in order of importance, have thus been summarised ("The Manufacture of Carbide of Calcium," by C. Bingham and C. H. Bingham, 1928): (1) Efficient design of factory and plant; (2) cheap electric energy; (3) pure and not too dear limestone; (4) pure and not too dear carbon in the shape of coal or coke; (5) cheap labour per ton of carbide; (6) proper facilities for distribution; (7) packing material at reasonable cost; (8) electrodes of good quality at reasonable prices. In whatever district the plant is situated, most of these factors will be sufficiently similar not to influence the costs decisively one way or the other, the really important ones being the cost of electric power, coal (anthracite) and limestone.

There was in the Parliamentary debate a difference of opinion upon this point, inadequately supported by figures to permit of definitive expression of opinion as to which side was right. The promoters of the Bill estimate that the cost of electrical water power at Corpach would be 0.112d. per unit, as against 0.2d. for the first 32,000,000 units and 0.18d. thereafter in South Wales. For the manufacture of one ton of carbide the power required is 4,000 units, a cost at Corpach of 37s. 4d. a ton. If the total cost of making carbide in Norway be as stated in Parliament—25s. a ton—it is evident that even at Corpach the British cost would be prohibitive without assistance from the taxpayer. It will be remembered that in Sir Alexander Gibbs's presidential address to the Institution of Chemical Engineers in 1928, the cost of power in pre-war Norwegian hydro-electric stations was given as 0.035d. per unit at the switchboard, but in 1928 (*loc. cit.*) "the average cost at the switchboard of hydro-electric power in the most favourable conditions in a large-scale development on a 100 per cent. load factor lay between 0.065d. and 0.125d. per unit." The

cost per ton of carbide, if based upon the most favourable pre-war generating station, would thus be 11s. 8d., whilst if the generating station were built 10 years ago, with the higher capital costs then ruling, the cost of power per ton of carbide would be between 21s. 8d. and 41s. 8d. According to detailed cost figures given by Bingham (*loc. cit.*) the cost of power in a large factory is only about 15 per cent. of the total cost of carbide manufacture, including packing. We should like further information as to the derivation of the figure of 25s. mentioned in Parliament.

The advocates of a factory in South Wales pointed to anthracite duff at 5s. a ton for a 30-year contract as their answer to the Corpach figure of 0.112d. a unit. Again quoting Sir A. Gibb, we may assume that in the most favourable conditions, and at 100 per cent. load factor, electricity could be generated from coal at 0.175d. a unit. The cost of

coal in this instance was not stated, but let us place it at 15s. a ton, with a consumption of 1.5 lb. per unit; if the coal used was anthracite duff at 5s., and if the efficiency of use were the same as with the 15s. coal (a large assumption), the cost per unit for current would decrease to 0.095d.; if the initial coal price was 10s. a ton, the duff price would be 0.135d. per unit. Unquestionably, there is ground for a searching inquiry into the price at which current could be produced *for the purpose of this plant*, and it is by no means certain that the price for current production at 100 per cent. load factor over 8,500 hours a year would not be low enough when taken in conjunction with the low cost of transport of the raw materials—anthracite and lime—to turn the scale in the direction of South Wales, even on economic grounds. The scales are sufficiently evenly weighted to make the proposed inquiry desirable.

Notes and Comments

The Younger Spirit

HAVE the older chemical organisations missed their opportunity for keeping in contact with the younger spirit that is so prevalent in the chemical profession to-day? The question is prompted by the outspoken remarks of Dr. J. Vargas Eyre, president of the British Association of Chemists, in responding to the toast of the Association at the London Section dinner last Saturday. In twenty years the British Association of Chemists has attained a position of importance which it would certainly not have reached if the older societies had been as fully alive as they might have been to the importance of catering for the younger entrants to the profession. Freshness of outlook is clearly a characteristic of the Association, and its meetings, whether business or social, are invariably inspiring. Recent events, however, have pointed to an awakening on the part of bodies like the Institute of Chemistry to the needs of the newer generation. Whether that is because some of the seniors, having occupied the presidential chair of the Association, have caught the enthusiasm of the B.A.C., or because the younger members have become more articulate we do not know, but the tendency is all to the good, and the Association may take a major share of the credit for any improvement that may ensue.

Zinc Stearate

A USEFUL investigation has been carried out among members of the Association of British Chemical Manufacturers to find an answer to an inquiry addressed to the National Safety First Association as to the dangers involved in the use of small quantities of zinc stearate. The hazards connected with the use of zinc stearate are inhalation of the powder, poisoning by ingestion, ignition of the inflammable vapours given off when the powder is heated, and explosion of the dust. According to the Association's report evidence of harmful effects from the inhalation of zinc stearate in industry is lacking except negatively, in that no firms in Great Britain so far as can be ascertained have ever experienced trouble

from it. The general view seems to be that zinc stearate is not toxic, *i.e.*, it has no specific poisonous action analogous to that of lead; that common sense indicates the use of efficient dust respirators and/or exhaust systems in atmospheres contaminated by zinc stearate or by any other finely divided powder, because of the possibility of its clogging the fine passages of the lungs, and that there is a danger of ignition of the dust, and precautions should be taken to ensure that no metallic substances enter the grinding or sieving machine, and that static sparks should be prevented by efficient earthing. The Association's findings, which are summarised in the March issue of the "Industrial Safety Bulletin," have been referred to the Birmingham University Department of Industrial Hygiene and Medicine.

Protecting the Consumer

VINEGAR is a product of fermentation and it is not permissible to sell as vinegar a substance which is not a product of fermentation was the ruling of the Bow Street magistrate last week when he imposed a fine on a shopkeeper for selling as table vinegar a substance which was 100 per cent. artificial vinegar. Since the early part of the seventeenth century the commodity ordinarily sold in this country as vinegar has been the product of fermentation, and it was not until 1890 that the artificial substance made its appearance on the market, although possibly there may have been isolated cases in which it was sold as vinegar as far back as 1860. Both vinegar, the product of fermentation, and the substance sold in the case under consideration, are composed of acetic acid diluted in much the same proportions, but the acetic acid in the one is produced in a way different from that in the other. Real vinegar has a better aroma and flavour and contains other products of fermentation not present in the artificial variety. There is nothing wrong in selling artificial vinegar as such, but until the chemist can produce a commodity that is in all respects equal to the real thing it is the duty of the public analyst to see that the two varieties are kept separate and distinct when sold over the counter.

Chemistry—Whither?

By F. SHERWOOD TAYLOR, M.A., B.Sc., Ph.D.

MEN of science are greatly addicted to patting themselves on the back. Pride is pardonable to those who have transformed a world and given to an unimproved man the equipment which might turn the head of an angel. If a cloud settles on the brow of the observer of the scientific scene, it is because he has given the world too much, not too little. It is healthy, then, to review our science of chemistry, not only by looking back on the conquered field, but by peering into the regions which have not yielded their secret.

The method of scientific discovery is that of the termite with a tree-stump; we nibble where others have nibbled before until the whole subject is exhausted. Only the exceptional ant starts on a new tree. No one can hope to foretell the future of chemistry or indeed of any other science. It is easy to predict that subjects partly worked out will be further worked out: it is more interesting to try to see the greatest deficiencies of our science and the possibilities of removing them.

The Idealist's Dream

The idealist's dream of "chemistry of the future" is a sheet of paper covered with mathematical symbols. Spectra, says he, will supply complete data as to the energies and nature of the processes which take place within the atom. Wave-mechanics will supply the means of interpreting them. A calculation will tell us whether and how, let us say, stannic chloride will react with pyrrolidine. To predict this seems at present to be an optimism as absurd as, thirty years ago, it would have been to predict that the whole of the lines of the hydrogen spectrum could be accounted for by calculation from quite simple assumptions. *Qui vivra verra*. But, descending to a lower step of the prophetic altar, one may well think it likely that in a short time it will be possible to calculate whether certain simple molecules can exist or not. It is only a few years since sulphur monoxide and the fluorine oxides were discovered. It would be rash to believe we have exhausted even the possible binary compounds. Wave-mechanical calculations may soon tell us which of these could be stable, and so prompt our practical chemists to further research. When we know just why H_2O and H_2O_2 exist, while H_2O_3 does not, we shall be moving towards the conversion of inorganic chemistry into a rational science.

The Major Task of Chemistry

The major task of chemistry, in laboratory and factory alike, is the synthesis of compounds. The tendency of recent years has been towards a steady increase in the use of catalytic methods. The Haber ammonia process and the synthesis of alcohols provide ready examples. They may serve to remind us that we are ignorant of the foundations of these methods. We have no clear idea why or how particular catalysts influence particular reactions; and it is in these catalytic processes that the most refined and beautiful chemical methods are to be found.

In our factories and laboratories we subject compounds, in the language of an ancient alchemist, "to intolerable violence." High temperatures and powerful reagents bring the molecules to the verge of disintegration. Our reactions take place: if there is no very high yield and a plentiful supply of useless by-products, we are not dismayed. We forget entirely that the blind forces of life have evolved a wholly different synthetic chemistry quite unlike our own. Plants and animals synthesise sugars and other carbohydrates, hydroxyacids, purines, alkaloids, tannins, proteins, which we can make, if at all, only with the greatest difficulty. We shout "Hurrah!" when we can synthesise in a large factory by an elaborate process the indigo which a plant concocts in the slenderest compass. The animal or plant requires little or no

heat and no mineral acids for its syntheses. It makes its catalyst, the doubtless rather complex molecular tool we call an enzyme, and the process goes smoothly and specifically to its appointed climax.

Nobody supposes that the enzyme is alive and picks out its molecules like a sorting demon and makes them combine. It is a physical substance and presumably not beyond the power of man to make and utilise. When enzymic syntheses become perfected, the heat, smell and dirt will depart from our chemical works, which will be white and sterile like hospitals. Reactions will proceed smoothly at blood heat in glass-lined tanks; autoclaves and melting pans will be no more. The field of enzymic synthesis is by no means unexplored, in spite of the fact that it presents very great difficulties to its workers. A wise government would give it the strongest encouragement, for in it lies almost the only hope of realising the ideal of synthesis of food from air, coke and water.

Neglect of Slow Reactions

The brevity of life and the urgency of the income-tax demand has led to an almost total neglect of slow reactions. The processes of living nature often occur over periods of days or weeks, though they may also be quite rapid: the processes which have led to the formation of the mineral kingdom are exceedingly slow, and have led to some curious results. Who would have predicted the occurrence of vast masses of iron pyrites, made only with great difficulty in the laboratory? Who would have believed in the formation of a quartz crystal four feet long? The story of the forgotten gas-cylinder seems to be deeply significant. It lay unused for twenty years in a school laboratory. When brought into use the gas burned with a peculiar smoky flame and was found to contain a notable proportion of iron penta-carbonyl. Who would have predicted that iron and carbon monoxide would react at room temperature? Here is a vast field unexplored. We throw down the sink anything which has not reacted in a few hours and thus arbitrarily refuse to investigate any reactions of which the velocity is less than a certain quite considerable figure. There are perhaps as many slow reactions as rapid ones; the former doubtless yield as interesting products as the latter.

"Had we but world enough and time," we might seal up a few thousand tubes containing likely reaction mixtures and leave them in a warm place for seven years. If whisky can be stored seven years and sold at a good profit, it is not possible to maintain that a slow chemical process is necessarily uneconomic on a large scale.

Development of Plastics

It is a remarkable reflection on human inventiveness to reflect that no new class of material was invented between 1000 B.C. and 1850, A.D. when the first plastic, ebonite, came into use. It cannot be pretended that there is any lack of workers in the field of plastics: it is my intention rather to suggest that Nature has done the same thing rather better. Our plastics have molecules which may be looked on as chains or nets of carbon atoms. The same is true of Nature's materials, wood, plant-fibres, silk, horn, hair and the like. Our plastics are inferior to these chiefly in toughness, strength and elasticity. These valuable properties are largely due to the orientation of molecules into an ordered structure. The carbon chains of the cellulose molecules lie side by side, and form little bundles which combine to the fibre unit. An aeroplane spar of ash is thus a possibility. We should not readily make one of bakelite. But if we learn to orient the molecules in our plastics, whether by mechanical treatment, the use of the centrifuge or the effect of a magnetic field, we shall produce such materials as may sweep the world and make this indeed an Age of Plastics.

The chemist lacks a technique for the handling of really large molecules. There is no doubt that there are infinitely more kinds of molecules with molecular weights greater than 1,000 than with molecular weights less than 1,000. Such molecules need not be unstable: witness the great stability of those of many complex azo-dyes and of the phthalocyanines. The numerous uses of the natural polysaccharides, starches, gums, and higher polymers, indicate the valuable properties such large molecules can have in industry. But substances of high molecular weight are investigated with great difficulty. They cannot be distilled or sublimed. They are usually insoluble or form colloidal solutions. Analyses yield but uncertain data as to their formulae. In Fourier analysis and other X-ray techniques, which have thrown so much light on structure, we may find the secret of examining the nature of the large molecules we may prepare. But a new technique is needed for the handling of these large molecules and there seems no indication that it is on the way.

The chemist, perhaps, shows a certain conservatism in his adherence to homogeneous systems. The most remarkable laboratory in the world—the living cell—is certainly not homogeneous. It is probably an exceedingly fine honey-comb of delicate lipid films enclosing a liquid content in which again are suspended granules, insoluble droplets, etc. It is in this highly disperse system that its efficient and surprising

syntheses are performed. It is possible to suppose that molecules oriented half in and half out of a delicate film may react very differently from the manner in which they would react when meeting higgledy-piggledy in a homogeneous solution. The remarkable effects of surface catalysis go far to confirm this notion.

There have been periods in the history of the sciences when their possibilities have seemed to be almost exhausted. The Greeks by 500 A.D. had done almost everything that could be done with Euclidean geometry. The science remained quiescent until the discovery of the use of infinitesimals stimulated it to new life, to be once more revived by the study of the non-Euclidean systems. We chemists are employing what is substantially the technique of Democritus and Mary the Jewess, who lived about 100 A.D. We sublime, distil, filter, evaporate, boil and melt, just as they did. Naturally we have learnt a great deal about these methods in eighteen centuries, and a remote Arab has taught us how to recrystallise. But substantially our chemical technique has altered very little. It may well be that we have got to learn to do something new with substances before we can sail into the uncharted sea of large molecules.

What new technique is possible? you may say. If I could answer that question, I should be in the laboratory trying it out, and should not be romancing about a chemical fairy-land.

Synthetic Tannins and their Uses

A Special Role in the Manufacture of Light Leathers

A LECTURE on "Synthetic Tannins and their Uses" was given by Mr. F. G. A. Enna, of Monsanto Chemicals, Ltd., at the Leathersellers Technical College, London, on March 16, with Mr. M. C. Lamb, ex-Principal of the College, in the chair.

Mr. Enna traced the idea of a synthetic tannin to Weinschenk, who in a German patent described how a leather could be prepared by treating pelt successively with formaldehyde and alpha or beta naphthol, the actual tanning agent formed being methylene dinaphthol. This method was not however entirely practical. The main consideration in the early development of synthetic tannins was to obtain water-soluble products, and with this in mind, Stiasny in 1913 prepared his Neradols. This was accomplished at Leeds University, but was exploited commercially by the Badische Co., later to be merged into the I.G. Farbenindustrie. There are certain similarities between synthetic resins and synthetic tannins, and had it not been for the development of the former, the lecturer said that the synthetic tannin industry would hardly exist to-day as it did.

Process of Condensation

Explaining the basis of synthetic tannin manufacture from coal tar products, Mr. Enna stated that in the majority of cases, tanning properties were conferred through the process of condensation. The basis of manufacture was really Williamson's reaction, and he took as an example the treatment of benzene with formaldehyde in the presence of a trace of acid or alkali when diphenylmethane was formed. This could be looked upon as the parent substance which had to be rendered soluble in water. This was accomplished by sulphonation at low temperatures to give the sulphonic acid. Diphenylmethane disulphonic acid when partly neutralised would precipitate gelatin, but had no true tanning action. This compound could be further condensed to give a four chain structure with three CH_2 bridges. This was a type of non-tanning synthetic tannin which, however, had useful application in filling a leather. The presence of an OH group directly attached to the ring (phenolic OH) would change these to actual tanning compounds. This was typified by Stiasny's Neradol D which was prepared by the sulphonation

and condensation of phenol. Croad had shown many years ago that the conditions of condensation governed very largely the properties of the resultant synthetic tannin.

Although the CH_2 bridges between the aromatic nuclei were essential and also the phenolic OH group, the masking of this latter, for example by esterification or alkylation, would still yield a tanning agent and probably one with increased fastness to light. With such masked products, however, there was an increased sensitiveness to electrolytes. Long chains of carbon rings did enhance tanning power and the longer the chain, the less acid was required to bring about complete solubility, a point of practical importance. In spite of advances, however, the cresols and naphthalene were still the main raw materials used in the making of synthetic tannins. The preparation of fast-to-light synthetic tannins required in the production of white leathers had centred round the sulphones, although absolute fastness to light starting with aromatic hydrocarbons had not yet been accomplished.

A Recent Advance

In the combination of the urea-formaldehyde resins with synthetic tannins to give light resisting products, some difficulties had been met with, but if diphenylsulphone was coupled up with the requisite amount of the urea-formaldehyde resin, a superior type of synthetic tannin was obtained, types of which were at present on the market. It was emphasised that although the reactions proceeding in synthetic tannin making were simple as expressed on paper there was little doubt that more highly polymerised products were formed than could be expressed by a simple reaction. A recent advance had been to make use of water soluble urea-formaldehyde resins for the production of leather, and which was very resistant to ultra-violet light. Such products could be made practically neutral and the tanner could then adjust his liquor to any desired pH for his tanning.

Dealing with the more practical aspect of the subject, Mr. Enna pointed out that the modern synthetic tannin was usually designed for a specific purpose, and one made for re-tanning could hardly be expected to function as an effective bleach. Similar if a white, light resisting tannage was required, then the synthetic tannin designed for that purpose should be used.

Applications of Confined Spot Tests in Analytical Chemistry*

By HERMAN YAGODA, Fordham University, New York

THE use of paper impregnated with suitable reagents in establishing the presence of chemical constituents is probably one of the earliest developments in the art of analytical chemistry. Thus, as early as 23 to 79 A.D., Pliny records a method for detecting the presence of ferrous sulphate in verdigris using a test paper saturated with an extract from gallnuts.

Rhodian verdigris is subject to sophistication with powdered marble, pumice, or gum. The most successful adulterant, however, is shoemaker's black (ferrous sulphate), for the others can be detected by the gritty feel when ground between the teeth. To detect adulteration with shoemaker's black, place a portion on papyrus previously steeped in extract of gallnuts which blackens immediately in the presence of the adulterant (1).

The diverse chemical reactions resulting in the production of characteristic colour phenomena have in recent years received considerable study by Gutzeit (4), Feigl (3), Tananaeff (7), and numerous other workers who have developed the methods for the detection of the elements by making use of the capillary properties of filter paper in enhancing the colour reaction. Systems of qualitative analysis have been developed by Engelder (2), van Nieuwenburg (6), and Hynes (8) embodying these tests for the final identification of the different ions. These *Tüpfelreaktionen* or spot tests are made by adding a drop of the solution of the sample to a specially retentive paper impregnated with a suitable reagent. The presence of a given constituent is made manifest by the formation of an irregular coloured area, or a series of coloured zones on the test paper.

The writer has found it advantageous to confine the spot test within the compass of a uniform area of definite cross section, with the aid of a water-repellent barrier embedded in the fibres of the paper. By means of this technique it becomes possible to execute the tests on filter paper of the usual porosity without loss in sensitivity owing to the spreading of the spot over a large surface. Also, as a result of the uniformity both in the area and tint of the spot, it is possible to approximate the concentration of the ion from the intensity of coloration produced by the drop of solution.

A large number of substances such as waxes, resins, and the cellulose esters can be employed in the formation of water-repellent zones on filter paper. Paraffin wax is recommended in this work, owing to its general inertness to chemical reagents and to the ease with which it can be embedded in diverse patterns on the paper. The paraffin rings are formed by warming the metal tube of the tool A (Fig. 1) over a small flame until the edge nearest the wooden handle becomes warm to the touch; the hot end is then brought to the surface of a slab of paraffin and the adhering film of

molten wax is transferred to the sheet of filter paper. This method produces rings of sufficient uniformity for qualitative spot tests.

To make a series of enclosures of practically identical cross-sectional area, immerse a thin sheet of absorbent tissue paper in a bath of liquid paraffin, drain, cool and lay the waxed sheet over the filter paper to be inscribed. By momentarily pressing the hot edge of the metal tube against successive parts of the waxed tissue, paraffin rings enclosing areas of uniform diameter are printed through the filter paper. The pressing operation is facilitated by supporting the filter and waxed sheets on a smooth pad of writing paper.

By means of tool C (Fig. 1), it is possible to embed the paraffin so as to leave a series of confined absorbent areas on the filter paper in one printing operation. This instrument is made by drilling holes of the desired size in both sides of a flat piece of brass or aluminum measuring about $10 \times 5 \times 1.3$ cm. ($4 \times 2 \times 0.5$ inches), and polishing the drilled surfaces so as to leave smooth printing faces. Provision should be made in the centre of the slab for the location of a removable wooden handle. The tool is operated by warming the plate in a drying oven to about $70-80^\circ\text{C}$.; the handle is then inserted and the hot plate is pressed against a paraffined tissue as

described above. The print made with this tool on the filter paper is represented in Fig. 2.

The exact size of the area confined by the paraffin varies with the temperature of the printing tool, the pressure, the time of contact, and the porosity of the filter paper. The diameter of the absorbent region is usually somewhat smaller than the dimension of the printing tool. Thus, in making a series of rings with the cylindrical tube, A (Fig. 1), the confined areas measure between 12.7 and 12.2 mm. in diameter. In preparing test papers for quantitative analyses, it is advantageous to employ the metal slab, for though the above-mentioned variables are still present, the inward flow of the paraffin is the same for all the areas printed.

It is convenient to locate the rings on circular sheets of filter paper within a region bordered by an inscribed square, as shown in Fig. 3. By folding the paper along the edges of the square the sides form a sup-

port for the region containing the absorbing spots. The resulting unit resembles a porcelain drop plate in appearance. Papers prepared in this fashion and impregnated with the proper reagents can be employed advantageously in determining the end points of volumetric processes that necessitate the use of external indicators.

The filter paper employed in this method of analysis should be of a readily absorbed texture and when used for a quantitative analysis the surface should be as smooth as possible. The entire sheet of paper may be impregnated with a

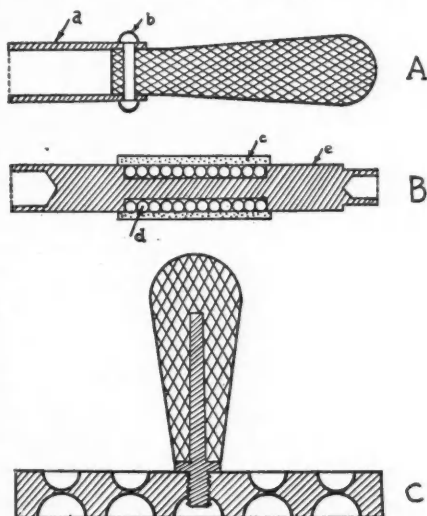


Fig. 1. Tools for Making Confined Areas.

(a) Brass or aluminum tube, 4×1.27 cm. (b) Copper bolt. (c) Rubber tubing. (d) Asbestos cord. (e) Brass rod with 0.95 and 0.63 cm. holes.

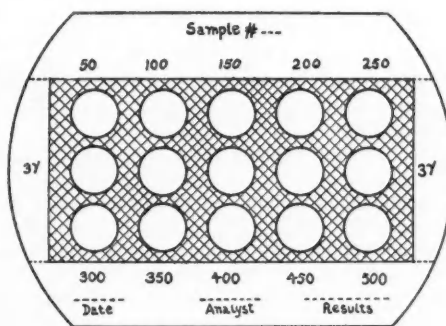


Fig. 2. Paraffined Print made by Tool C.

* Reprinted from "Industrial and Engineering Chemistry," Analytical Edition, February 15, 1937.

solution of the reagent and dried previous to the formation of the rings, or a definite volume of the reagent is permitted to evaporate within the confined areas on the untreated sheet. The latter procedure has the advantage that the amount of reagent deposited within a given area can be accurately determined from the volume and concentration of the solution permitted to evaporate within it. When the entire sheet is steeped in a solution, the reagent is deposited more uniformly over the surface of the dried paper, and this is an important factor in obtaining spots of uniform tint.

Deposition of Reagent

In making analyses by the confined spot method, the amount of reagent deposited within the absorbent area should be in

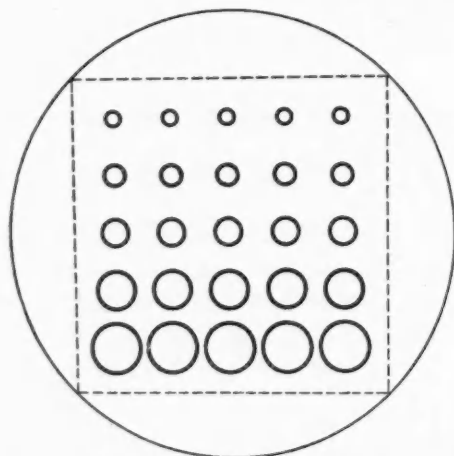


Fig. 3. Paraffined Rings formed with Tools A and B.

sufficient excess to complete the reaction with the substance in the drop taken for analysis. When the entire paper is steeped in solution and dried, it is not possible to gauge the surface concentration of the solid reagent by weighing the paper before and after the deposition because the sheet cannot be dried to constant weight. This quantity can be approximated by application of the following rule: The volume of liquid imbibed by a filter paper after being immersed in it and permitted to drain is approximately equal to the volume of the paper. Circular sheets of filter paper measuring 12.5 cm. in diameter and 0.020 cm. in thickness have a volume of 2.45 cc. Experiments revealed that the volume of water absorbed by such sheets averaged 2.35 ± 0.01 cc., which is in fair agreement with the theorem. After immersion in alcohol only 1.96 cc. of the liquid were found to be absorbed. This deviation from the rule is partly due to the evaporation of the alcohol during the weighing of the wet paper, but chiefly to the low viscosity and surface tension of the liquid which permit its more complete drainage from the paper.

This formulation is probably also valid for dilute solutions whenever the solute does not markedly alter the surface tension of the solvent. In working with the 1 per cent. solutions of the reagents commonly used in spot analysis, it can be assumed that filter paper of 0.020-cm. thickness will retain after drying 160 γ or 180 γ of the solute per sq. cm., depending upon whether the paper is wetted with an alcoholic or an aqueous solution. A more exact value of this quantity can be ascertained from the weight of solution absorbed by several sheets of the paper.

Test Positions of Fixed Volume

The volume of small test portions taken from a solution can be ascertained by counting the number of separate drops delivered by a clean pipet of calibrated volume. When filled with water or dilute aqueous solutions, the standard 1-cc. pipets deliver drops having an average volume of about 0.05 cc., which are suitable for making qualitative spot tests. To gauge the concentration of a solution by the method

described it is desirable to work with large drops in order to secure greater accuracy and to avoid irregularities in the tint of the spot. Such test portions can be obtained either through the use of calibrated micropipets, or by the diverse types of stalagmometers employed for the determination of the surface tension of liquids. Previous investigations (5) reveal that the volume of drops falling from an orifice can be ascertained with great accuracy by means of these special dropping pipets, but the elaborate precautions necessary for their dependable operation are not in harmony with the simplicity of the present method of analysis.

A Simple Stalagmometer

The simple stalagmometer shown at A (Fig. 4) can be made by reconstructing a Folin-Wu pipet. The tube can be employed to obtain large drops of constant volume, provided the dropping surface is kept clean and the operator has a steady hand. The chief difficulty in its application is that often the drop will fall from the orifice before it has grown to equilibrium size as a result of too rapid formation or mechanical vibration. The capillary pipet illustrated at B is recommended for general use in transferring test portions of solution to the reacting areas. It is operated by filling to the mark with the solution and blowing the contents on to the circular area, keeping the tip at right angles about 2 to 3 mm. above the centre of the spot. At the point where the contents are nearly emptied, the tip of the pipet should touch the globule of solution deposited on the absorbent spot, and should be withdrawn from the liquid on the appearance of the first air bubble. The pipet is calibrated by weighing the water delivered by it to a piece of filter paper printed with a confined

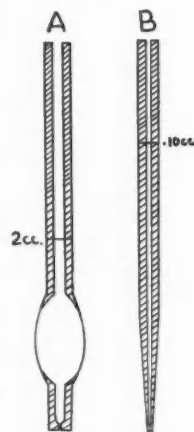


Fig. 4. Pipets for delivering large-sized drops.

are supported in a wide-mouthed weighing bottle, using the same technique as that described above. Several such determinations made with a 0.1-cc. pipet showed that the volume delivered could be reproduced with an accuracy of 0.3 per cent.

Limits of Discernibility

In order to obtain coloured spots of sufficient uniformity of tint to permit the estimation of the quantity of the ion present in the test sample, the solution must be diluted to a point where the area of the confined spot contains a considerable excess of reagent over that necessary to complete the chemical reaction with the ion in question, and the quantity of the coloured product formed must be large enough to be readily noticeable to the eye. With the two metals investigated in the present report, nickel and copper, it was found that a range of concentration between 100 and 10 γ per cc. was suitable. In making a series of test spots over this range of concentration a difference of 10 per cent. in the concentration of two test solutions of equal volume could be readily discerned by the change in colour intensity of two adjacent spots of equal area.

There are several methods for adopting these properties to the estimation of the concentration of dilute solutions. In the first, the colour made by a test portion of the sample is compared with the colours made by test portions of several solutions containing known quantities of the element being investigated. This method, though direct in the interpretation of the results, necessitates the preparation and storage of numerous solutions. Another possibility is to take advantage of the fact that the minimum quantity of an element detectable on a spot of fixed area is a fairly reproducible constant for a given observer. By diluting the solution in successive stages until the vanishing point is reached, the total quantity of an

ion present in it can be calculated from the final volume and known concentration at that point. The method selected for investigation in the present report is a compromise between the two methods just mentioned, in that the solution being analysed is diluted to a point where a test portion produces a spot which matches in colour an adjacent spot produced with a standardised solution of the element.

The colours of adjacent spots are best compared after the test portions become dry. Small differences in the shape of intensely coloured spots are readily discerned in transmitted light. The spots resulting from dilute solutions can be compared by a reflected light, as the precipitate is almost entirely deposited on the upper surface of the filter paper. In working at the dilutions necessary for the successful operation of this method of analysis, it is safe to assume that there will be no appreciable change in volume as a result of the mixing of the solution with solvent and that the final volume of the mixture will be equal to the sum of the component liquids.

Detection of Metallic Ions

The several salts of nickel and copper employed in these investigations were purified by crystallisation. In the case of hydrates the crystals were permitted to dry at room temperature until the crop attained constant weight. Standard stock solutions of nickel and copper were prepared by dissolving weighed quantities of $\text{NiSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$ and $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ in water and diluting the solutions to definite volume. Gravimetric analyses of these solutions showed that they possessed the same metal content as that calculated from the weight of the dissolved salts, proving that standard solutions can be prepared for this work by dissolving known amounts of a pure salt of the metal in question.

The minimum quantities of the metals that can be detected on spots of varying area were determined by diluting portions of the stock solution and transferring 0.029-cc. test portions to the absorbent areas. The test papers were impregnated with 1 per cent. alcoholic solutions of dimethylglyoxime and α -benzoinoxime for use with nickel and copper, respectively. The results of these dilution experiments, recorded in Table I, show that by decreasing the diameter of the spot the presence of successively smaller amounts of the metals can be established in droplets of the same volume.

TABLE I.—DETECTION OF NICKEL AND COPPER

Diameter of Spot Mm.	Ni ⁺⁺ γ	Cu ⁺⁺ γ
12.7	0.090	0.32
9.5	0.067	0.26
6.3	0.050	0.17
4.8	0.036	0.12
3.2	0.021	0.075

Estimation of Nickel and Copper

To establish the amount of an element present in a sample, dissolve a weighed portion in water so as to make about a 0.1 per cent. solution. If acid is employed to effect solution of the material, the excess should be removed by evaporation to near dryness or by a process of neutralisation before diluting the solution to the desired strength. Prepare a test paper as shown in Fig. 2, transfer a 0.1-cc. test portion of the solution to the first area on the top row, and pipet 50 cc. of the remaining solution to a dry 600-cc. beaker. Deposit test portions of known strength on the centre row of spots containing either 2 or 3 γ of the element sought. The colour of the spot made by the first portion should be considerably darker than the standard spots. Dilute the solution pipetted into the beaker with successive 50-cc. portions of water, transferring test portions of each dilution product to the remaining areas on the paper. It is convenient to make the markings of the spots numerically equal to the total volume of the solution from which the test sample was taken. When the paper dries, compare the tint of the spots made at the successive dilutions with the colour of the standards, noting at which dilution the intensities match.

The percentage of the element in the sample is then computed by means of the relationship:

$$P = \frac{v_o Vc}{10v_d w}$$

In this expression v_o represents the volume of the solution containing the sample, v_d the volume of the aliquot taken for dilution, V the volume at which the test spot matches the standard spot, w the weight of the sample in milligrams, and c the concentration of the standard solution expressed in γ units of the element per cc. If v_o is 100 cc., v_d is 55 cc., and c is 30 γ per cc., as in the case of the experiments recorded below, the above expression simplifies to $P = 6V/w$.

TABLE II.—DETERMINATION OF NICKEL AND COPPER

Salt	Reagent	c	w	P	Error %
$\text{NiSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$ (%Ni = 14.86)	Dimethylglyoxime	30	124.9	14.4	
		20	114.5	14.4	
		20	81.3	14.8	
			Av.	14.5 \pm 0.2	2.0
$\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ (%Cu = 25.5)	α -Benzoinoxime	30	103.6	26.1	
		30	97.1	24.7	
		30	84.2	25.0	
			Av.	25.3 \pm 0.6	0.8
$\text{Cu}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot \text{H}_2\text{O}$ (%Cu = 31.9)	α -Benzoinoxime	30	88.8	30.4	
		30	80.8	31.6	
		30	69.8	31.0	
			Av.	31.0 \pm 0.4	2.8

In Table II are recorded the results of several analyses of pure nickel and copper salts arrived at by following the above procedure. The difference between the observed and calculated figures is in the range of 1 to 3 per cent. This limits the application of the method to analyses where speed is of greater importance than accuracy, or to circumstances where only minute fragments of a sample are available. It may be possible to reduce the error to about 1 per cent. by making the test on porous filter paper of a smoother finish than that manufactured at present for filtration purposes.

The results obtained for copper indicated that the method can be used to determine the end point of an electrolytic copper determination by removing a test portion from the electrolyte and comparing the colour of the spot with one of known copper content. If the test indicates that an appreciable amount of the metal is still in solution, the amount removed in the test sample can be corrected for if it is found to exceed the error in the weighing of the electrode.

By confining spot tests to regions of uniform area it is possible to approximate the amount of an ion present in a solution from the tint of the coloured spot. By means of this technique it has been possible to determine the metal content of pure nickel and copper salts with an accuracy of 1 to 3 per cent. Work is in progress on the refinement of this method of analysis and its application to the determination of $p\text{H}$, the direct analysis of the mineral content of drinking waters, and the assaying of ores and alloys. This technique should also prove useful in biological analyses of the composition of blood and urine.

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Chemical Industry Finance

By S. HOWARD WITHEY, F.C.I.

THE balance sheet submitted by Tate and Lyle, Ltd., shows that the stocks of refined sugar were considerably lower at the end of the financial year, but owing to an unusual increase in cash the current assets totalled a much higher figure than the previous year. The balance of net profit was slightly lower, and after placing £284,000 to general reserve the carry forward was raised from £56,234 to £58,874, the dividend of 18½ per cent. on the ordinary shares absorbing £868,700. In the case of the United Molasses Co., Ltd., an increase in the balance of net profit from £233,627 to £370,068 enabled £110,000 to be placed to the reserve fund, and this was further increased by means of a surplus of £122,643 on the realisation of investments. While the actual profit on molasses was down by £100,000, an increase was established by the earnings of the company's fleet, and an improvement during the first two months of the current year has been reported. During the past five years there have been wide variations in the balance of net profit realised by the East India Distilleries and Sugar Factories, Ltd., although with the exception of 1934 the dividend on the ordinary shares has been maintained at 10 per cent.

The demand for toughened glass has caused several firms to build additional factories, and in order to meet the cost

and secure sufficient working capital new shares have been issued. In the case of Lancegaye Safety Glass (1934), Ltd., the issue of 800,000 shares of 1s. denomination at 3s. each in the proportion of one for every three shares held on January 28, has been delayed by legal proceedings, but it has been stated that any decision of the Courts is not likely to be adverse to the company.

During the twelve months to October last, a trading profit of £97,686 was made by Low Temperature Carbonisation, Ltd., representing an increase of £19,205 in relation to the previous year's figure. No revenue was received from the new Bolsover works, and only half a year's benefit was derived from the new oil and chemical plant at Barugh, the balance of net profit being shown at £61,233, or an increase of £13,970. The ordinary dividend has been increased from 3½ per cent. to 6 per cent., absorbing £58,331, and the carry forward from £9,096 to £11,998.

A substantial improvement was reported by the directors of International Combustion, Ltd., the gross profit for the past year being £170,150, as compared with £114,800. After debiting directors' fees, the net profit proved to be £164,050. The distribution on the ordinary capital was increased to 30 per cent. by means of a cash bonus of 10 per cent.

Chemical Trade in Brazil

Increased Purchases of British Chemicals

NOTWITHSTANDING a general decrease in the percentage of United Kingdom goods purchased by Brazil in 1935, chemical products showed a rise of 3.8 per cent. in volume and 2.5 per cent. in value, while caustic soda increased by 4.2 per cent. in volume and decreased by 2.4 per cent. in value. The United Kingdom supplies about two-thirds of the total Brazilian imports of caustic soda. In 1935 23,113 metric tons of caustic soda, valued at £218,000 (gold), were imported from all sources, of which 16,103 tons came from the United Kingdom, and 5,678 tons from the United States.

In their recently issued report on economic and commercial conditions in Brazil, published by the Department of Overseas Trade (H.M. Stationery Office, 3s.), Mr. E. Murray Harvey and Mr. W. G. Bruzaud, commercial secretaries to the British Embassy, Rio de Janeiro, state that a new chemical factory, known as the Companhia Electro-Chimica Fluminense, was opened in May, 1936, at Alcantara in the State of Rio de Janeiro. German experts and material were employed, the cost of the latter having amounted to 8,000 contos of reis. The estimated annual production was reported to be as follows: Caustic soda 1,080 tons, liquid chlorine 230 tons, chloride of lime 1,000 tons, hydrochloric acid 1,000 tons, and hypochlorite of sodium 1,000 tons. It is understood that the Caixa Economica (National Savings Bank) of Rio de Janeiro helped to finance this scheme.

Oiticica Oil

According to a report received from the British Consul at Pernambuco, the production of oiticica oil is a new industry which has developed largely within the last two years. The oil is stated to be equal to Chinese tung oil and is used in the preparation of paints and varnishes. There is a brisk demand for the oil, and four presses are now in operation in the town of Fortaleza, in Ceará, and three oil mills (one Dutch) are being built in the interior of Parahyba for crushing oiticica nuts. In 1935 the total Ceará production reached 1,264 tons. Practically all the oiticica oil is shipped to the U.S.A.; a

recent shipment was quoted at 13 cents per pound c.i.f. New York.

The State of Ceará has prohibited the export of oiticica seeds. The move is inspired by the dread of a similar fate to that of the Amazon wild rubber collecting industry, which furnished seeds to nascent rubber industries in other parts of the world and was later overwhelmed by them. Penalties have been prescribed for those who cut down trees, and certain exemptions from taxation have been granted to companies who establish mills for the extraction of this oil.

Carnauba wax, which is obtained in the form of a fine scale from the surface of the leaves of a species of palm tree, is a commodity the value of which per ton has risen enormously of recent years. The demand for this wax, which is used in the manufacture of polishing pastes, typewriter ribbons, duplicating carbon paper and the like, appears to exceed the supply. Mamona or castor seed is yet another oil seed with an increasing export and one commanding a good price.

New Artificial Silk Works

Referring to artificial silk, the report states that the Nitro-Chemical plant (belonging to the Klabin Irmaos-Votorantim consortium) now being built at Sao Miguel (about 12 miles from Sao Paulo) which is to cover an area of over 10,000,000 square feet, will be the largest plant of its kind in the world. Its daily capacity of 12 tons of artificial silk will require 40,000 tons per annum of cotton linters. Fifty tons a day may be produced of concentrated sulphuric acid (an important raw material for the future industrial development of Sao Paulo); another 50 tons per day of nitro-cellulose and 30 tons of nitric acid. The factory can also be adapted to produce 50 tons per day of gun cotton and dynamite. This company will be an important addition to the local artificial silk industry, the value of production of which in 1934 was said to be about 31,000 contos, divided between the Companhia Brasileira de Sedas "Rhodiaseta" and the Visco-Seda Matarazzo Ltda.



Members and guests at the annual dinner of the London Section of the British Association of Chemists

Grasping the Opportunity of the Younger Idea

British Association of Chemists' Dinner and Dance

THERE was a good attendance at the annual dinner and dance of the London Section of the British Association of Chemists at the Waldorf Hotel, London, on March 20. Mr. G. T. Gurr (chairman of the Section) was in the chair.

Miss W. WRIGHT (hon. secretary of the London Section) proposed the toast of "The British Association of Chemists" and said the B.A.C. stood above all else for the professional and economic welfare of chemists as a body and as individuals in a way which no other body did or could do. It had tackled the job from quite a different viewpoint from the older chemical societies. If the economic level of chemists was raised then the profession would attract better brains and better brains would automatically bring greater rewards to the employer, the employee, and the whole community. A good labourer was worthy of his hire; how much more so was a good chemist, on whose skill and judgment rested so many of our complicated chemical processes which had become such an essential and important part in our complicated modern civilisation. If we took the case of medicine, the fact was that although doctors were engaged in searching for new cures for old diseases, it was the organic chemist who furnished the new medicinal drugs to be tried out. In the air, the chemist was required to find light metals which would withstand the strain of prolonged rapid flight under adverse weather conditions with sudden buffeting from storms and wind. The purity of our food was in a large measure due to the work of the food chemist, and so on.

The Unemployed Chemist

Having dealt with the position of the chemist in work, Miss Wright dealt with the less happy position of the chemist not in work, and said it was here that the B.A.C. was an ever present help in time of trouble. Its unemployment fund had, since its inauguration, paid out over £11,000 and had accumulated funds of over £12,000. This fund was on professional lines and members all over the country had received assistance. It was one of the very few professional unemployment insurance schemes run for the benefit of the members of a professional society. Working in close association with the

unemployment benefit fund was the appointments bureau, and through this it was often possible to place members in satisfactory positions before they had drawn the full six months benefit to which they were entitled, and for which they had subscribed. Again, when applying for a post, members were able to consult the Association on salaries, terms of employment, and other relevant matters embodied in the particular agreement they were required to sign. In cases of wrongful dismissal the Association's legal advisers were able to give expert advice as to the best course to take. It had been established in court that three months was a reasonable notice for a chemist.

Mr. S. REGINALD PRICE asked to be allowed to add to the toast the name of the London Section and to ask Dr. Eyre to respond both as regards the Association and the London Section, which represented roughly 50 per cent. of the membership. There seemed to be a certain enthusiasm in London unequalled in the other sections, largely due to the work of the chairman, Mr. Gurr, and the hon. secretary, Miss Wright.

Growing in Vigour and Membership

Dr. J. VARGAS EYRE, responding to the combined toast, said he had joined the ranks of the Association rather late, but found he had joined a body which was unique in as much as it was growing in vigour and membership, whereas other organisations were finding it difficult to keep their ranks together and to pay their way. Those who had been responsible for the development of the Association must now feel their effort had been worth while. It was a little mysterious to him how it had come about that the older organisations had allowed these newer groups of people to come into existence and flourish. It was a pity, but perhaps in their quieter moments the more old-fashioned organisations felt they had let slip through their fingers the opportunity of keeping in contact with the younger spirit that was so prevalent to-day. It was essential to grasp the full opportunity of the younger idea, and the B.A.C. was doing that. It was for that reason he had had the greatest possible pleasure in accepting the office of president of the Association. It had been a great

pleasure to him to attend some of the meetings of committees of the Association and see the earnestness with which those concerned devoted themselves to the work. It was all voluntary work and done out of the goodness of their hearts, solely with the object of giving benefit to the members of the organisation, notwithstanding that nobody could help being busy these days and that this voluntary work cut severely into what leisure there was available. In regard to what Mr. Price had said concerning the energy displayed in the London Section, Dr. Eyre said he had been impressed with that. At the same time there was a vigorous spirit in Manchester, and

also in Derby and Notts and Bristol, and he added that he hoped to visit all the centres during his year of office and come back and report what jolly good fellows they all were.

Mr. W. H. WOODCOCK proposed "Our Guests," and extended a cordial welcome to Sir Gilbert and Lady Morgan, Mr. W. A. Damon (chief inspector under the Alkali Acts), and Mrs. Damon, Professor A. G. Green (president of the Society of Dyers and Colourists) and Mrs. Green, Mr. H. J. Pooley (general secretary, Society of Chemical Industry) and Mrs. Pooley, and other guests.

Mr. W. A. DAMON briefly responded to the toast.

Oil and Colour Chemists' Association

Closer Contact Between Manufacturer and User

THERE was a company of some 120 members, ladies and guests at the nineteenth annual dinner of the Oil and Colour Chemists' Association, held at the Trocadero Restaurant, London, on March 19. Dr. G. F. New, president, was in the chair.

Mr. W. G. SUTHERLAND, president of the Incorporated Institute of British Decorators, proposed "The Oil and Colour Chemists' Association." Remember that he was ignorant of the science of the oil and colour chemists, he said he was nevertheless alive to its immense potentialities as it affected and would continue to affect the craft he represented. Decoration had been described as the product of intuition rather than of reason, and of magic rather than of logic, but he would describe modern paint chemistry as magic on a basis of logic. It was to the advantage not only of the profession of paint chemistry, but also of the craft, that the paramount value of the paint chemist should be recognised, but from what he had been told this was not always so. He had been informed that 40 years ago the paint chemist was a mere checker of raw materials, that he worked in isolation, and that as a consequence he tended to be ill-informed and out of touch with current thought, but that was by no means the case to-day, and would be still less so as time went on. At present the paint chemist was the man around whom the paint industry revolved, and that had brought its problems. It had become more and more manifest that the paint manufacturer and user should discuss their problems, and from that point of view it was a matter for great satisfaction that the paint manufacturers had pooled part of their resources in a co-operative research scheme.

Discussion of Common Problems

The Oil and Colour Chemists' Association had acted on the same principle for it had given its members an opportunity of discussing common problems to the great advantage of all concerned. However, he felt the march forward would be all the more successful, if not only the advance guard, but the whole army participated and, therefore, he suggested the craft which he represented was, if not a part of the army, at all events a close ally, and that the objective could not be wholly reached unless they participated in as much as they both depended greatly on each other. Therefore, he suggested consideration should be given to ways in which the contact between manufacturer and user could be increased.

The PRESIDENT, responding, agreed with Mr. Sutherland that the paint manufacturer wanted more contacts with the user, because the materials which the manufacturer turned out would stand or fall by the work of the decorators with these materials; therefore, unless the chemists worked with the decorators they might as well not work at all. Referring to the guests, the president mentioned Dr. Vargas Eyre, the president of the British Association of Chemists, and director of research of the Distillers Co., and Mr. A. L. Hetherington, of the Department of Scientific and Industrial Research, commenting on the valuable work which Mr. Hetherington

had done in connection with the industrial research associations.

Mr. JOHN CROMBIE (Scottish Section) proposed "The Guests" in an amusing speech in which he said he once heard it asked what was a research chemist, and the answer given was "A fellow who finds out things about things." He suggested there could not be many things which at all events some of the guests that evening did not know something about, having regard to the positions they occupied in science and industry.

Mr. R. B. PILCHER, registrar and secretary of the Institute of Chemistry, responded and spoke of the close relationship that had existed between the Association and the Institute for a number of years, inasmuch as the Association's offices were in the Institute's building. He had watched the growth of the Association with the greatest pleasure, because he was convinced that however much they might talk of amalgamation of societies, there would always be the need for special bodies such as the Oil and Colour Chemists' Association to deal with special problems. That was one reason why he believed that the more the Association prospered the more it would be to the general good.

Foreign Chemical Notes

Hungary

SYNTHETIC BENZINE AND VARIOUS BY-PRODUCTS from the hydrogenation process are to be produced in a new factory to be established by the Salgotarjan Iron and Steel Co. Negotiations have begun for the acquisition of the Fanto Co. of Budapest, which has a quota from the Cartel of 16 per cent. of the Hungarian benzine output.

Japan

THE MAGNESITE DEPOSITS in North Korea are to be worked by Hokusen Seishi Kagaku Kogyo K.K., a subsidiary recently established for that purpose by the Japanese paper-making firm.

POTASSIUM FERROCYANIDE and potassium permanganate are now being produced by the Mano Seiyakusho Chemical Works (Mano Chemical Works) of Osaka in the respective monthly outputs of 5 tons and 10 tons.

AN EXPLOSIVES FACTORY is to be established in North Korea by the Nippon Kayaku K.K. of Osaka. A subsidiary company, Chosen Kayaku Seizo K.K., has been founded with a capital of five million yen, and a factory is to be built with a daily output of 10 tons of nitrogen explosives. The plant will be driven by water-power.

OVER-PRODUCTION OF PHOSPHORUS is to be remedied by rationalisation. Nippon Seiren, Kinsan Electrochemical and Toyo Electric Industry have agreed to fuse their business into one large concern to be called Japan Phosphorus Industry. The new firm has announced an increase of price, and intends to restrict output by about 30 per cent.

Spectroscopy in Industry

Second Conference on Industrial Physics

IN his presidential address on "Spectroscopy in Industry," at the second conference on industrial physics organised by the Institute of Physics at Birmingham on March 18, Professor A. Fowler, F.R.S., said that although spectroscopic methods of analysis were now finding useful applications in numerous industrial establishments there could be little doubt that if the simplifications which were now available were more generally known, these methods would be far more widely adopted. It was not to be expected that ordinary chemical analysis would ever be entirely superseded, but for many purposes spectroscopic tests would give all the information required, and in other cases would often effectively reduce the work of the chemist. Moreover, spectroscopic methods had a great advantage in the rapidity with which an analysis could be carried out, and in indicating with comparatively few exceptions, all the elements which were present in a sample, even to minute traces.

A Simplified Spectroscope

He proceeded to give an account of some of the methods of spectrum analysis, with special reference to instrumental and other simplifications which had been introduced, and some examples of their application to practical problems. Qualitative analysis was comparatively simple and had been greatly facilitated by the introduction of spectroscopes by which the wave-lengths of the spectrum lines could be read off directly. A striking example of a simplified spectroscope was the Hilger "Spekker Steeloscope" for the rapid testing of steels. The identification of an element with this instrument merely involved a setting which was about as simple as the setting of a wireless receiver to a desired station.

Spectrum analysis could scarcely be simplified further, and as this instrument was also applicable for approximate quantitative estimations, it was not surprising that it had found its way into many industrial laboratories. A much wider field could be covered by photographic methods, using such an instrument as a quartz spectrograph. With a little training, an intelligent laboratory assistant could be entrusted with the experimental work, leaving the examination to the convenience of the physicist or chemist in charge.

The idea underlying most of the methods of quantitative analysis was that as the percentage of an element in a mixture or alloy was reduced, there would be an accompanying decrease in the intensities of its spectrum lines, so that a correlation between percentages and intensities could be found by experiment on samples of known composition. Much of the exploratory work had been done in industrial laboratories, and notably in Birmingham by Dr. Brownson and his colleagues in the laboratories of I.C.I. Metals, Ltd. Extensive systematic investigations had also been carried out by Mr. D. M. Smith on behalf of the British Non-Ferrous Metals Research Association. The results which had been obtained for a considerable number of materials of practical importance would greatly reduce the preliminary work of others who might contemplate the adoption of similar methods.

Application to Agricultural Chemistry

Spectroscopic methods were being effectively employed in other directions than those of metallurgy. One of them was to agricultural chemistry, where the materials for analysis were mostly soils, fertilisers and parts or ashes of plants. Certain elements which were present only in traces had been found to have an important influence on plant growth, and the spectroscopic identification of these was far more rapid and certain than by any chemical method. For example, a small quantity of boron had been found essential to the growth of good crops of sugar-beet, mangolds and turnips, and producers of borax were already counting on an increase

of their sales through the addition of borax to the recognised fertilisers. The general theory of spectra would no doubt form a valuable guide in future developments, but there was little hope for a long while of a purely theoretical quantitative analysis.

The value of spectrographic analysis for numerous industrial purposes had been amply demonstrated by results which had been reported. There was no lack of excellent instruments, and it was gratifying to be able to state that some of the acknowledged best in the world were manufactured in London.

Letter to the Editor

Oil from Coal at an Economic Price

SIR,—In fairness to a great new British industry may I be allowed to correct certain statements made in the House of Commons on March 18 by Sir Samuel Hoare, First Lord of the Admiralty, and Mr. Kenneth Lindsay, Civil Lord, in regard to oil produced from British coal? In the course of a Parliamentary debate it must be difficult, if not impossible, to review the present situation adequately; that fact, nevertheless, cannot justify certain statements made on the floor of the House and widely reported in the Press.

In the first place, it must be realised that the extraction of oil from coal is no longer an experiment, and, while it is true that the Government are continuing their research work, it is equally true that the process has long since passed the experimental stage. The production of oil from coal on a commercial and profitable scale is now definitely established as a new industry in Great Britain. Low Temperature Carbonisation, Ltd., who supplied the first consignment of fuel oil to the Admiralty as long ago as 1932, have already four works in operation and have embarked upon an extensive policy of expansion. Only last week, Mr. Ernest Brown announced in the House of Commons that this company was to establish new works in South Wales.

Regarding the question of cost, to which attention was given in the debate, we are not, of course, in a position to know the price at which the Admiralty are able to cover their requirements of foreign petroleum, but it is common knowledge that the Government are large shareholders in one of the principal petroleum importing companies. Apart from that important circumstance, it is to be assumed that, when foreign oil is purchased for use in the British Navy, it is not subject to the standard import duty of 1d. per gal., as the petroleum would not actually be released from a bonded store.

It is beyond argument that British oil can now be produced from British coal at an economic price. The very large quantities now reaching the market are being readily absorbed; indeed, although the supply is not yet equal to the home demands, certain distillates of British coal oil are actually being exported to buyers in North and South America. This new industry is, in short, self-supporting, and there is nothing to stop an immediate expansion such as would enable the country to have at its disposal greatly increased supplies of oil derived from its own coal. If that expansion could be helped forward, the result would not only confer substantial benefits on the mining industry, but the population, as a whole, would have at its command a considerable reserve not only of fuel oil but of petrol, both of which would be of appreciable value for the purposes of home defence.—Yours faithfully,

COLIN BUIST, Director.

Low Temperature Carbonisation, Ltd.
23, Grosvenor Place, S.W.1.

Transmutation of the Heavy Elements

Royal Institution Lecture by Lord Rutherford

DURING the last few years, our knowledge of the transmutation of the elements by artificial methods has grown with great rapidity, and practically all the known elements have been found capable of transmutation on a small scale when bombarded by fast particles of suitable type, said Lord Rutherford, F.R.S., in a lecture given at the Royal Institution on March 19. By means of an ingenious apparatus called the cyclotron, Lawrence has been able to produce copious streams of protons and deuterons with energies as high as 6 million volts and moving with velocities even greater than the α -particles from radioactive substances. Such swift deuterons are capable of producing transformations even in heavy elements like platinum and bismuth. There is some evidence that the deuteron is broken up into its constituent proton and neutron in the intense field which exists close to a nucleus. The neutron may then be captured by the nucleus while the proton escapes. For example, four active elements are produced from platinum, two of which have the same chemical properties as platinum and are thus new unstable isotopes of that element, while the other two behave like isotopes of iridium. All of these new bodies break up with the emission of β -particles and each has a distinctive period of decay.

Bombardment of Bismuth

The bombardment of bismuth by fast deuterons is of particular interest as it leads to the production of a radioactive isotope of that element identical in radioactive and chemical properties with the natural radioactive body, radium E. This important result has been confirmed by showing that this artificially produced radium E gives rise to polonium—the first of the radioactive elements separated by Mme. Curie in 1897 from uranium minerals.

In general the neutron is extraordinarily effective in producing transformations in the majority of the elements. In a number of cases very slow neutrons are far more efficient in this respect than fast ones. A suitable source of neutrons for such experiments can be obtained by bombarding beryllium

with α -particles from radium. The fast neutrons can be slowed down by allowing them to pass through material containing hydrogen, for example, water or paraffin. In this way more than 80 new radioactive isotopes have been discovered, most of which break up with the emission of β -particles. The action of neutrons on the heaviest known element, uranium, has been the subject of close study by Hahn and Meitner during the past two years. Work with this element presents special difficulties on account of its spontaneous radioactivity. Nine new and distinctive radioactive bodies have been observed when uranium is bombarded by slow or fast neutrons. All of these break up with the emission of β -particles and with half-periods of decay varying from eight seconds to three days.

New Radio-Active Elements

It may well be that other radioactive elements of still longer life may yet be observed. Hahn and Meitner have conclusively shown that not only are three new radioactive isotopes of uranium formed, but also radioactive elements of higher atomic number than uranium. These trans-uranic elements produced by neutrons have chemical properties similar to those to be expected from eka-rhenium, eka-osmium, eka-iridium and eka-platinum, corresponding to elements of atomic numbers 93, 94, 95 and 96 respectively. It has been found that the new radio-element formed from uranium breaks up in a series of successive stages analogous in many respects to the well-known sequence of changes which occur spontaneously in uranium and thorium. The results indicate that three new radioactive series are formed, two of which probably arise from the main isotope of uranium (mass 238) after the capture of a neutron, and the third may be due to a less abundant isotope of uranium (mass 235). It does not appear that the bombardment of uranium by neutrons has any effect in accelerating the natural disintegration of this element. A complex series of transformations also arises when the second heaviest element, thorium, is bombarded by neutrons.

Nickel More Widely Used in Industry

Increased Production and Sales

THE report of the International Nickel Co., of Canada, Ltd., for the year ended December 31, 1936, shows a net profit of \$36,865,526 after all charges including provision of \$8,446,639 for taxes and \$7,814,731 for depreciation, depletion and other purposes. The comparable figure for 1935 was \$26,086,527. After disbursement of \$1,933,898 for preferred dividends there remained \$34,931,627, equal to \$2.39 per share on the 14,584,025 shares of common stock outstanding. This compares with \$1.65 per share in 1935.

Commenting on the year's results, Mr. Robert C. Stanley, chairman and president of the company, stated that throughout 1936 the company's business continued to improve. Sales of nickel exceeded those of any prior year, and were 30 per cent. greater than the volume reported for 1935. Sales of copper and the platinum metals were also substantially greater than in any previous year, and better prices for these metals were obtained. Plants were operated at capacity and an all-time peak production of metals was established. From an efficiency standpoint the results were gratifying and many economies were brought about. Extensions to the smelting works at Copper Cliff and the nickel refinery at Port Colborne, together with additions and betterments to plants in

Great Britain and the United States, were largely completed towards the close of the year. This expansion programme entailed an expenditure of \$11,202,265, and will increase productive capacity to more than 220,000,000 lb. of nickel in all forms per annum.

Sales of nickel in all forms increased from 129,850,207 lb. in 1935 to 168,927,980 lb. in 1936, an increase of 30 per cent. Estimated world deliveries of nickel in all forms from all sources during 1936 were slightly in excess of 200,000,000 lb., as compared with the estimate of 160,000,000 lb. for the previous year. There was thus recorded the fourth successive annual increase in world consumption. Sales of monel, the nickel-copper alloy made direct from Creighton ore, increased from 13,411,624 lb. to 16,730,789 lb. or 24 per cent.

The nickel industry, somewhat in advance of other basic industries, has been progressively recovering during the past four-and-one-half years from the most severe trade reversal in generations. Production facilities were again extended to provide "standby" capacity necessary as a foundation for expansion in consequence of continued research and commercial activities. Furthermore, a strong financial position has been attained which is so essential as a prudent safeguard

against future fluctuations in business and provides for plant additions as required. At the same time the established policy of integrating plants, metallurgical processes, and personnel was further pursued with resultant economies.

The company, which recovers precious metals entirely from its copper-nickel ores, has become a large world producer of platinum, palladium and rhodium, and also produces ruthenium and iridium. Sales were made in all principal markets of the world and exhibited wide distribution in scientific and commercial fields. Its sales of all platinum metals have increased in the past several years from 19,300 ounces in 1932 to 124,424 ounces in 1934 and 220,980 ounces in 1936. The

demand for the platinum metals established a new record, with world purchases in excess of 400,000 ounces. This was an increase over the preceding year of approximately 125,000 ounces, of which a portion was purchased for investment and speculative purposes.

There has been an increased use of platinum and palladium for electrical contacts, and of platinum and rhodium for dies for extruding glass fibres. Platinum and platinum-rhodium catalysts, used in the synthesis of sulphuric acid and of nitric acid, have also been in greater use, a consequence of the increased output of such acids, the larger portion of which is produced with catalysts of this type.

New Technical Books

SOAP. By William H. Simmons. Fourth Edition. London: Sir Isaac Pitman & Sons, Ltd. Pp. 140. 3s.

Since the third edition of this book was published, some four years ago, there have been important developments in many directions in the manufacture of the various kinds of soap. Various changes which have taken place in the raw materials used for the production of the different classes of soap base are described; also improvements in the methods of manufacture, and in the subsequent additions to the soap. Many of these are the subjects of patents, references to which are given, so that the original specifications may be consulted.

* * *

DISPERSE SYSTEMS IN GASES, DUST, SMOKE AND FOG. A General Discussion reprinted from the "Transactions of the Faraday Society." London: Gurney and Jackson. Pp. 1,300. 12s. 6d.

The subject of this discussion includes a great variety of natural and artificial systems which are described by such terms as dust, smoke, fog, fume, haze, mist and cloud. All these consist of solid or liquid material dispersed to a greater or lesser extent in gaseous media. They all show a great tendency to change and none are permanent when compared with the more familiar colloidal solutions. Thus dusts settle, smokes coagulate, and clouds dissipate by evaporation. The behaviour of systems of non-volatile and volatile particles considered separately. To the former category belong most dusts and smokes and some industrial fogs, such as tar fogs; and to the latter the majority of natural systems, such as country fogs, mists, etc., in which the particles are composed of water or dilute solutions of hygroscopic nuclei. It is obvious, however, that there is no clear dividing line between these two classes. These systems of non-volatile particles have in recent years attracted the attention of scientific workers, both abroad and in this country, so that a short summary of their properties may usefully serve as a focusing point for further investigations.

* * *

COLORIMETRIC METHODS OF ANALYSIS. Vol. I. Inorganic. By Foster D. Snell and Cornelia T. Snell. Second Edition. London: Chapman & Hall, Ltd. Pp. 766. 45s.

In the first edition of this book, published in 1921, no attempt was made to treat the subject comprehensively, or to include organic and biological applications, and nephelometric methods. The importance of developments in those fields, as well as in the field of colorimetry, however, now warrants a much more inclusive treatment of the subject, which has been made in this edition. In Vol. I the general subject of colorimetry is covered, together with inorganic determinations. Vol. II contains organic, biological and miscellaneous methods. Although there is a sharp distinction in technique between colorimetric and nephelometric methods, no such sharp distinction can be made between the solutions to be examined by the two techniques. The possibilities of the methods are intriguing. As an example, phosphorus, manganese, nickel, titanium combined carbon, and several other elements can be determined in a few minutes in iron or steel. The applications

to rapid control methods in industry have barely been touched. With the breadth of application of chemical methods to-day, no one can be familiar with all of the possible applications of a given method. A method totally unsatisfactory for one purpose may be ideally suited to another, because of variations in the nature and source of samples. A method giving the maximum possible accuracy will be desired for one purpose and involve unnecessary work for another. Therefore, having to choose between the selection of a limited number of methods or of completeness, the authors have elected completeness of both methods and references, with notations of contradictory results where such have been published.

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A TEXT-BOOK OF ORGANIC CHEMISTRY. By Dr. Julius Schmidt. Third English Edition. By H. Gordon Rule. London: Gurney and Jackson. Pp. 865. 25s.

Since the preparation of the second English edition of this book, which appeared in 1932, notable advances have been made in the chemistry of various naturally occurring groups of biochemical interest. Among the most important of these are the complex polysaccharides, the polyene pigments, chlorophyll and haemoglobin, the vitamins, and the sterols, bile acids and sex hormones. Although in many respects the chemistry of these products is still far from complete, their investigation has progressed sufficiently for accounts of the latest developments to be included in the present text. In addition to the sections dealing with new material such as this, further extensions or alterations have been made wherever it has been deemed advisable, either for the purpose of bringing the subject-matter up to date or of presenting the facts in a truer perspective. The rearrangement of the preliminary general section, which was adopted tentatively in the second edition, has been retained.

* * *

CATALYTIC REACTIONS AT HIGH PRESSURES AND TEMPERATURES. By Vladimir N. Ipatieff. New York: The Macmillan Co. Pp. 786. 30s.

This book is primarily a collection and review of Dr. Ipatieff's researches in the field of catalysis during the past 35 years. It is his chemical autobiography. For that reason, no attempt has been made to collect the literature or to include the work of others except in special cases where it was desirable to emphasise and develop certain features. The author states that he has devoted his entire scientific lifetime to the exploration of this little known and difficult field. In the interests of the history of catalysis, it is important that the correct significance be placed upon his investigations. He was the first to demonstrate the possibility of hydrogenating in the liquid phase (the hydrogenation of liquid hydrocarbons and of the salts of unsaturated acids). These results would be impossible according to the theory and method of Sabatier. Dr. Ipatieff's investigations during the past 5 years have resulted in the development of certain hypotheses applicable to the catalytic reactions of dehydration, polymerisation, alkylation, and isomerisation. Some of these results are published for the first time in this book.

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Royal Visit to Boys' Hostel

King George's House

A FEATURE of the King's tour of South-East London on Wednesday of last week was his visit to King George's House, Stockwell, the new hostel for 216 working boys, the capital cost of which has been provided by King George's Jubilee Trust. His Majesty was received at the hostel by Lord Portal, vice-chairman, and Sir Campbell Stuart, treasurer of the Trust; and Sir Ernest Benn, president of the Boys' Hostel Association, was presented to him. He was conducted through the house by Sir Ernest Benn and Mr. A. Townshend, warden, and in the library he met members of the Boys' Hostel Association and signed the visitors' book. King George's House will provide a home for boys who will come from the distressed areas or qualify for admission through lack of a real home in London. Actually it will provide four hostels, each of which will accommodate 54 boys and have its own superintendent and matron. All the residents will share in the club and recreation facilities of the central building, but they will live as four separate families on four separate floors.

Oil from Coal in South Africa

Departmental Committee Appointed

THE South African Government has appointed a Departmental Committee to examine the problem of oil from coal production. Mr. F. J. Fahey, chairman of the South African Board of Trade and Industries, will preside. This step follows the announcement that private enterprise was preparing plans for the early erection in South Africa of a Fischer-Tropsch oil from coal plant. The South African Government, for a considerable time, has had its own Fuel Research Board operating in Pretoria. From £30,000 to £40,000 has been spent each year on research work of various kinds.

It is believed that the action of the South African Government in taking over the control of petrol prices since December 7, 1936, is a preliminary step towards the direct encouragement of oil from coal production. The Australian Government is also reported to be paying attention to this problem.

Research in the Gas Industry

A Visit to Gas Light and Coke Co.'s Laboratories

THE laboratories of the Gas Light and Coke Co. at the Fulham Works were thrown open to inspection by Fellows of the Chemical Society on March 19. The visitors were received by Mr. H. Hollings, chief chemist to the company.

At these laboratories a number of problems connected with the manufacture and purification of coal gas and the recovery of by-products are being actively studied, and a wide range of apparatus of novel type was displayed. Vacuum-jacketed Dufton fractionating columns are used for the accurate fractionation of liquids. One type was shown separating dekaline into cis- and trans-isomers, and in another liquid methane was being distilled. By the use of a jacketed McLeod gauge it has been found possible to measure velocities of adsorption of hydrocarbons, such as benzene, on catalysts at elevated temperatures. In addition to the more conventional methods of gas analysis a new method has been developed in which the various components of the mixture are successively removed, and the change in volume is measured by observing the rate of travel of soap films. A test method has been developed for the quantitative determination of H_2S at dilution up to 1 part in 100 million of coal gas.

Work is also in progress on a number of problems involving the transfer of solute from one fluid to another by diffusional processes. Factors influencing the coefficients of transfer across both gas and liquid films have been studied in glass wetted-wall apparatus. This study is extended to a semi-works scale in a tower scrubber. Rates of transfer in two-liquid systems are being studied in an apparatus in which a solute is transferred from bubbles of one liquid to another through which they are flowing. Diffusivities of a number of solutes in aqueous and non-aqueous media are being determined by the use of the McBain cell.

A study of the precipitation of gummy particles from coal gas has included determination of the number of ions present, and the rate of their formation. Traces of nitric oxide in coal gas react with diolefine hydrocarbons and with the small amount of oxygen which is always present. The reaction leads to the formation of gummy products, and is characterised by an induction period. Gum formed by reactions of this type occurs as a suspension in gas. The particles are observed by an ultramicroscope with regard to number, size and growth.

Experiments in connection with the properties of adsorbent charcoal as used for the recovery of benzole from coal gas are also in progress. In connection with heating systems for adsorbent charcoal the corrosion of steel coils in the large scale plant has been found to be avoided by using closed heating and cooling systems in which water is circulated out of contact with air.

In the annexe to the laboratories an experimental high pressure hydrogenation plant is installed, with three units working at 200 atm. pressure. In the largest of these units adsorbent charcoal is regenerated by treatment with hydrogen, the medium size unit is used for liquid-phase non-catalytic hydrogenation of coal tar, and the smallest unit is employed for work on catalysts.

Sulphur Recovery Processes

Progress at Billingham

DETAILS of the progress made in this country and abroad in the economic recovery of sulphur were given by Mr. M. P. Applebey in a lecture on "The Recovery of Sulphur from Smelter Gases" before the Newcastle Section of the Society of Chemical Industry on Monday. The process developed at Billingham has now reached the commercial stage, being applicable to metallurgical gases of almost any SO_2 content, as well as capable of reducing SO_2 content of such gases below the limit of concentration at which they are a nuisance. Its first stage alone can be employed to give concentrated sulphur dioxide for liquefaction and sale.

An experimental pilot plant has been in intermittent operation at the Billingham works of I.C.I. for several years, and is now in continuous production of about 20 tons of SO_2 gas per day. A reduction plant having an output of 5 to 6 tons of sulphur per day is also in production. The new process may yet be applied to the extraction of sulphur from coal.

Several factors had prompted research into the problem of dealing economically with waste sulphurous smelter gases. One of these was the economic value of the sulphur wasted in this way throughout the world, amounting to two million tons per annum. There was also the desire for national self-sufficiency, and the necessity to abate the nuisance to health and to vegetation caused by the escape of acid gases.

Two successful recovery processes have been developed. One of these (the I.C.I. process) employs as a first stage a concentration process, followed by reduction of pure SO_2 to sulphur by means of coke. The other has been developed independently by Bolidens Gruvaktiebolag, of Sweden, and a company was formed last year, under the title of Sulphur Patents, Ltd., for the joint exploitation and control of the two processes.

The Boliden Process

The Boliden process has no concentration stage, and depends upon reduction of the raw smelter gases with gases derived from coke. Thus, its application is best suited to metallurgical gases relatively strong in SO_2 and low in oxygen content. Some 20,000 to 25,000 tons of high quality sulphur are produced annually at the Boliden Company's smelter at Rönnskär, Sweden, by this process. A copper smelter in Finland employs the I.C.I. process to produce 52 tons per day of liquid SO_2 from copper converter gases containing an average of 5 per cent. SO_2 .

Mr. Applebey explained how initial research at Billingham was directed towards evolving an efficient process for the concentration of the sulphur dioxide from the raw gases. This resolved itself into a search for a solution in which SO_2 could be absorbed in large quantities, and from which it could be readily regenerated. The choice eventually fell on a specially prepared solution of basic aluminium sulphate.

The lecturer described the SO_2 absorption plant now in use at Billingham, and showed how such difficulties as the tendency to sulphate and thio-acid formation had been overcome.

Mr. Applebey also described the second stage (the reduction of SO_2 to sulphur) with reference to the Boliden process. This is divided into three stages, comprising the manufacture of reducing gas, the use of this for the catalytic reduction of the SO_2 , and the cooling of the gases, with separation of the condensed sulphur by electrostatic precipitation.

Personal Notes

DR. CHARLES C. CARPENTER, acting on medical advice, is resigning the presidency of the South Metropolitan Gas Co. and the chairmanship of the South Suburban and Commercial Gas



Co., but is to retain his seat on the boards. He will be succeeded in each of the three posts by Mr. Frank Jones, now vice-president and acting chairman of the South Metropolitan Co. At the end of September Dr. Carpenter collapsed at a board meeting of the Commercial Gas Co. and was taken to his home at Cheyne Walk, Chelsea. Dr. Carpenter was president of the Society of Chemical Industry in 1915-1917 and was the Society's medallist in 1923. Born in 1858 he received his education in the fundamental principles of physical and chemical science at

Birkbeck College, and he commenced his life-long association with the South Metropolitan Gas Co. in the early eighties as a pupil of the late Mr. P. Wates, then engineer at the Vauxhall Works. On the retirement of Mr. Wates in 1884, Dr. Carpenter was appointed engineer at Vauxhall. In 1897 he was appointed deputy chief engineer and on the death of Mr. Frank Livesey in 1899 he became chief engineer. Nine years later he was elected to the board following the death of Sir George Livesey, and a week after this appointment he was elected chairman. Throughout his career he has been closely identified with the chemical industry, and in collaboration with a few of the leading manufacturers he was instrumental in forming the Association of British Chemical Manufacturers.

Mr. T. H. FAIRBROTHER, M.Sc., F.I.C., chief chemist to McDougalls, Ltd., is to fill the vacancy on the board occasioned by the retirement of Mr. Robert McDougall as from March 31, 1937. Mr. McDougall is leaving the board because he desires to reduce his business activities owing to indifferent health; he will, however, retain his seat on the board on McDougalls Trust, Ltd.

MR. CECIL JAMES SADLER, of Durham, chairman of Sadler and Co., chemical manufacturers, Middlesbrough, left estate valued £64,554, with net personalty £38,179.

MR. S. G. MEADE, junior technical assistant and assistant chemist at the Newark Corporation Gasworks for the past six years, has been appointed chemist to the Severn Valley Gas Corporation, and will take up his new duties at Tenbury Wells shortly.

MR. H. L. LONG resigned the office of secretary after ten years, at the annual meeting of the Chemistry section of the Leicester Literary and Philosophical Society. The following officers were elected: President, Dr. L. Hunter; president-elect, Mr. E. H. Butler; hon. secretary, Mr. J. L. Pinder.

MR. D. W. PARKES was elected chairman at the annual meeting of the Birmingham Section of the Society of Chemical Industry, on March 17. The other officers elected were: Mr. A. W. Knapp, vice-chairman; Mr. George King, secretary; Mr. W. T. Collis, treasurer; Mr. J. E. Such, recorder; and Mr. J. R. Johnson, auditor.

THE REV. JOSEPH HOCKING, the renowned Cornish novelist, who died at St. Ives at the age of 76, spent his early days in the china clay works of his home at St. Stephen's, near St. Austell. Both he and his brother, the late Rev. Silas Hocking, were sons of Mr. James Hocking, who was a sub-works-manager of a local tin mine, and, according to tradition, these two famous men actually worked as lads in the Rosevallen china clay works, and used to walk to St. Austell in quest of books.

LORD LEVERHULME, president of the Society of Chemical Industry, has been invited by Bebington Council, Cheshire, to allow his name to be included as Charter Mayor in a draft charter of incorporation which the council is submitting to the Privy Council. Lord Leverhulme has always taken a keen interest in the public life of the district and was chairman of the old Lower Bebington Council in 1919. Three years ago he presented a chain of office to be worn by chairmen of the council, and recently he presented to the council over six acres of land at Thornton Hough for use as a public recreation ground.

MR. ROBERT D. LITTLEFIELD, a retired inspector under the Alkali Acts, died on March 18 in his 65th year. Born at Ventnor and educated at Cranleigh and University College, London, he was, for a time, assistant to Sir William Ramsay and later was engaged in research work for the Royal Commission on Sewage Disposal with particular reference to river pollution. In 1909 he was appointed to an inspectorship under the Alkali Acts, and was thus brought into intimate contact with chemical industries in many parts of the country. From 1920 until his retirement in 1931, he was in charge of the South-Western District. He became an Associate of the Institute of Chemistry in 1898 and a Fellow in 1911, serving on the council from 1922 to 1925. He also took a great interest in the Society of Chemical Industry and was chairman of the Bristol Section from 1931 to 1934.

From Week to Week

BLACKWOOD, MORTON AND SONS, LTD., carpet manufacturers, Kilmarnock, are to erect a dye house in Tannock Street, Kilmarnock, at a cost of £8,000.

AN EXHIBITION OF "NEOPRENE" is to be held by Imperial Chemical Industries, Ltd., at the offices of the Federation of British Industries, 21 Tothill Street, S.W.1, from April 26 to May 1. In the past the search for synthetic materials of rubber-like properties has been merely with a view to finding a substitute for natural rubber. "Neoprene," however, has certain definite advantages over natural rubber which make it of great importance to industry generally. "Neoprene" is a product which is as easily handled in the factory as ordinary rubber, but is far more resistant to heat and to the deteriorating effects of vegetable, animal and mineral oils than natural rubber. Lectures will be given at 4 o'clock each afternoon on various applications of the material.

PRESIDING AT THE ANNUAL MEETING of Cooper, McDougall and Robertson, Ltd., Sir Richard Cooper referred to arrangements which were being made with Imperial Chemical Industries, Ltd., whereby their respective activities in the insecticide markets are clearly defined and, in certain directions, co-ordinated under the joint control of the two companies. The new company will have the support of the extensive research and manufacturing resources of Imperial Chemical Industries, Ltd., and the full benefit of the extensive network of trading connections which Cooper, McDougall and Robertson have established over a period of nearly a hundred years. The company's main business of dips, disinfectants, and animal remedies, will be in no way affected by the new arrangement concerning the insecticide branch of the business.

LEMENONE A, a new product of the Glyco Products Co., Inc., New York, replaces lemon oil completely in many cases, and in part for cosmetics, candies, cakes, beverages, ice creams, etc. Because of its low price, it can be mixed with lemon oil and thus reduce the cost of the flavoring or odour material considerably. Particulars can be obtained from the manufacturers, or from their representative in the United Kingdom, Rex Campbell and Co., Ltd., 7 Idol Lane, Eastcheap, E.C.3.

NEGOTIATIONS have been begun to form a cartel or marketing board for the china clay industry. This was announced at a meeting of the Leonora Corporation, Ltd., on March 18, by Captain A. H. Moreing, the chairman. This company is concerned in the china clay industry through its interest in Cornish Kaolin, Ltd. Captain Moreing added that since the old price fixing association collapsed, late in 1930, there had been the fiercest competition among producers for the market, with the result that for some time prices had been at an utterly uneconomic level.

A FULL-TIME CHEMIST is to be appointed by Lanarkshire County Council to test materials bought for road-making, to ensure that contractors conform to schedules by supplying the best grades. The appointment is to be made on the recommendation of Mr. William A. Chapman, surveyor, who states that a daily analysis is necessary so that faults in materials may be rectified without delay. Mr. Chapman estimates that the full-time chemist will be able to save his salary by obtaining better qualities and preventing adulteration of the various materials used for road-making. He thinks that the quality of the materials is as important as the engineering and construction.

THE BITUMEN REFINERIES PLANT CO., LTD., London, is to erect a new building covering two acres at Alloa for the blending of tar and bitumen.

A RESOLUTION was unanimously passed at an extraordinary general meeting on March 19, of Wiggins, Teape and Co. (1919), converting the shares of the company into stock.

WILLIAM WATSON, aged 45, was fatally injured at the central laboratory of the Gaskell-Marsh works, Widnes, of Imperial Chemical Industries, Ltd., last week, when he was trapped in machinery.

OWING TO CONTINUED EXPANSION of business Germ Lubricants, Ltd., have moved their London offices to more commodious premises at City Gate House, Finsbury Square, London, E.C.2. Telephone: National 9001 (4 lines).

THE COLTNESS IRON CO., LTD., in co-operation with Imperial Chemical Industries, Ltd., are making arrangements with a view to the erection of works in the Clyde area for the production of non-ferrous metal tubes for the shipbuilding, housing, and general engineering trades. It is proposed to form a new company for this purpose, and it is hoped the erection of the works will be commenced at an early date.

THE DEMAND for the products of the British Aluminium Co. increased progressively during 1936, and necessitated the gradual restarting of plant which has been idle for several years. As a result of the improved conditions, the directors have decided to extend the productive capacity of the Lochaber Power Co. and of the North British Aluminium Co. so as to utilise the whole of the available water supply.

REFERENCE TO THE NECESSITY for the production of calcium carbide in this country was made at the annual meeting of the Runcorn Chamber of Commerce on March 18. Mr. E. S. Lea deprecated the shelving of the Caledonian Power Bill, which the Runcorn, Widnes, Liverpool, and Birkenhead Chambers supported. It was contended that the matter was of such national importance that the Government should make a decision as to how and where calcium carbide could best be produced.

A FIRE occurred on Sunday in the yard of the Co-operative Wholesale Society's soap, candle and glycerine works in Fairhills Road, Irlam. A watchman saw smoke coming from a stack containing many tons of wax in bags and called the brigade. It was feared that a large number of barrels of oil near by might explode, but the firemen, although unable to approach within twenty yards of the seat of the fire because of the great heat, got the flames under control after about two hours' work. Most of the damage done by the fire was confined to the wax and a large quantity of coal stacked near by.

THE FEBRUARY SHIPMENTS of china clay were nearly 4,000 tons below the deliveries made in January, but considering the adverse shipping conditions and the shortness of the month, February's trade was satisfactory when compared with the corresponding period in 1936 there was an increase of over 5,000 tons. The shipments made at Fowey were very good, as were also those at Par, but Charlestown was down and neither Looe, Padstow or Penzance reported any business. The details were: Fowey, 44,182 tons china clay; 1,779 tons china stone; 1,836 tons ball clay. Par, 8,214 tons china clay; 182 tons china stone. Charlestown, 3,162 tons china clay; 272 tons china stone. Plymouth, 200 tons china clay. Newham, 176 tons china clay. Rail, 6,043 tons china clay, making an aggregate of 61,977 tons of china clay; 2,233 tons china stone; 1,836 tons ball clay, compared with 56,093 tons of china clay; 3,296 tons china stone; 2,821 tons of ball clay in February, 1936.

Forthcoming Events

BIRMINGHAM.

Apr. 1.—Institute of Metals. (Birmingham Section). "Modern Methods of Alloy Steel Analysis." B. Bagshawe. 7 p.m. James Watt Memorial Institute, Birmingham.

MANCHESTER.

Apr. 2.—Society of Chemical Industry (Manchester Section). Annual General Meeting and Short Papers. 7 p.m. Grand Hotel, Aytoun Street, Manchester.

Apr. 2.—Institute of the Plastics Industry. (Manchester Section). Section Annual Meeting and Social Gathering. Manchester.

New Companies Registered

Partons (1937), Ltd., Union Chambers, 27 Union Street, Swansea.—Registered March 10. Nominal capital, £200. Manufacturing, exporting, wholesale and retail chemists, etc. Directors: John Lewis, W. A. Lewis, and D. E. Lewis.

Belgravia Chemical Manufacturing Co., Ltd., 732 High Road, Leytonstone.—Registered March 13. Nominal capital, £1,000. Chemical manufacturers, chemists, druggists, dyers, oil and colour men, etc. Directors: Stewart J. Athorn and W. C. Abbott.

Chas. H. Windschuegl, Ltd.—Registered March 19. Nominal capital £35,000. To acquire the business of a dealer in drugs, chemicals, oils and essences carried on by Chas. H. Windschuegl, at 1 Leadenhall Street, E.C.3. Directors: Chas. H. Windschuegl, 1 Leadenhall Street, E.C.3, and A. E. Johnson.

Oystrox, Ltd., 4 St. Bride Street, Ludgate Circus, E.C.4.—Registered March 16. Nominal capital £100. Manufacturers of and dealers in chemicals, gases, drugs, medicines, plasters, fertilisers, oils, pigments, varnishes, etc. Directors: F. White and Edward P. Shaw.

Company News

Blythe Colour Works.—A final dividend on issued ordinary shares of 12½ per cent. actual, making 17½ per cent., less tax, is announced.

Burt, Boulton and Haywood.—The directors announce an interim dividend of 2½ per cent., less tax (same), on ordinary shares, payable April 10.

John Knight, Ltd.—The directors report a decline in profits from £246,455 to £227,159 in 1936. A transfer of £20,000 is made from contingencies reserve, and after including £139,562 brought in, there is a total of £386,722. The dividend on the £300,000 ordinary capital—all of which is held by Levers—is unchanged at 40 per cent., less tax, while the 25 per cent. preferred ordinary dividend takes £125,000, leaving £141,722 forward.

General Refractories, Ltd.—A final dividend for 1936 of 10 per cent. is announced, making 16 per cent., against 15 per cent. in 1935. The final dividend is being paid on an issued capital as increased from £325,000 to £475,000. An extraordinary general meeting is being held on March 31 to approve a further increase in the capital to £650 by the creation of 300,000 new 10s. ordinary shares to be offered to shareholders in the proportion of three new shares to every ten held and at a price below market price. These new shares will rank for dividend in respect of the financial year commencing January 1, 1937.

United Premier Oil and Cake Co.—It is announced that the final ordinary dividend for 1936 is 6 per cent., less tax, accompanied by a 2½ per cent. cash bonus, making a total payment for the year of 12½ per cent., an increase of 2½ per cent. The 1936 distribution is payable on a capital increased to £196,875 by the 5 per cent. capital bonus which accompanied the 1935 dividend of 10 per cent. The company owns a controlling interest in Premier Oil Extracting Mills, Ltd., John L. Seaton and Co., Ltd., Sowerby and Co., Ltd., Universal Oil Co., Ltd., and Wray, Sanderson and Co., Ltd. These companies are engaged in the business of vegetable oil extraction, seed churning, and cattle cake manufacturing.

British Aluminium Co.—The directors report that the net earnings in 1936 rose from £486,449 to £597,181, and they recommend a dividend of 10 per cent., against 7½ per cent. for the past two years. Cash has risen almost £90,000, to £344,763, against £255,523, and investments in subsidiaries are slightly higher at £1,320,065. Loans and advances to subsidiaries at £3,971,534, compare with £4,015,608 at December 31, 1935, and stocks of metal, etc., have advanced substantially by £51,923, to £690,138. The amount owing to subsidiaries is almost half of last year's total at £35,541, but sundry creditors are up from £431,773 to £474,434. The authorised capital is to be raised to £7,000,000 by the creation of 2,500,000 additional ordinary shares of £1.

Joseph Crosfield and Sons.—An increase of £32,936 in profits is shown in the report for 1936. The profit figure is £821,694, which compares with £788,758 for 1935. This has permitted an increase in the dividend on the ordinary shares from 37½ per cent. paid for 1935, to 40 per cent. for 1936. This will absorb £600,000, while the 1935 dividend required £562,500. The dividends on the four classes of preference shares absorb £227,500, and the balance carried forward is £150,653, compared with £156,459 brought in. The profit figure includes the company's proportion of the profits of subsidiaries and allied companies, partly estimated. General reserve account remains at £450,000. Creditors, tax provision and accrued liabilities are reduced from £242,747 to £210,106, while provision for dividends is shown at £269,199, against £315,548, in the 1935 balance sheet. Premises and plant appear at £1,179,846, against £1,210,449, holdings in subsidiaries at £846,930, against £799,970, and in allied companies £3,249,198, against £3,301,775. Stock figures at £421,170, against £388,581, debtors £230,105, against £296,727, and cash £52,709, against £67,252.

Books Received

Absorption and Extraction. By Thomas K. Sherwood. London: McGraw-Hill Publishing Co., Ltd. Pp. 278. 21s.

Report of the Water Pollution Research Board for the Year ended June 30, 1936. London: H.M. Stationery Office. Pp. 56. 1s.

Weight Lifting by Industrial Workers. Home Office Safety Pamphlet No. 16. London: H.M. Stationery Office. Pp. 45. 1s. 3d. (postage extra).

Weekly Prices of British Chemical Products

THERE are no price changes to report in the London market for general heavy chemicals, rubber chemicals, wood distillation products, perfumery chemicals, essential oils and intermediates. In the coal tar products section there has been a general price increase in all grades of cresylic acid; carbolic acid, crude 60's; naphtha, solvent 90/160 and 90/190; naphthalene, crude, whizzed or hot-pressed; and medium soft pitch during the week. Tartaric acid has advanced from 1s. 0½d. to 1s. 1½d. per lb.

MANCHESTER.—With the approach of the Easter holidays trading conditions on the Manchester chemical market during the past week so far as new business is concerned has been relatively quiet and orders have been on no more than a moderate scale. There has, however, been no slackening off in the call for deliveries against contracts and although there will be the usual seasonal break in these a steady resumption is looked for early next week. Although there is still considerable room for improvement the demand for the wide range of textile chemicals both from the cotton and woollen trades is on a fair scale, and there is a good demand from most other branches of the consuming in-

dustries. Price conditions generally are on a firm basis. In the by-products market, also, values are extremely firm in most sections and an active demand has been reported this week.

GLASGOW.—There has been a steady day-to-day demand for chemicals for home trade during the week, but export inquiry has been rather limited. Prices generally continue very firm with several small advances, but some lead products exceptionally are lower, on account of the fall in the price of pig lead. Latest reports from the coal tar products market indicate that prices for most materials are well maintained, and further advances are shown in cresylic acid and creosote. In carbolic and cresylic acids no disinclination towards forward buying is manifest, and fair quantities of both products have been booked ahead at top prices. Inquiries for high boiling phenols have also been more numerous. Creosote shows a firmer tendency, and high tar acid oils are in strong demand. Refined naphthalene is firmer and steady business is being conducted in fire lighter qualities. Heavy pyridine bases are less active, but the 90/140 and 90/160 qualities find a ready outlet at to-day's advanced prices.

General Chemicals

ACETONE.—£45 to £47 per ton.
ACID, ACETIC.—Tech., 80%, £30 5s. to £32 5s. per ton; pure 80%, £30 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £42 to £46.
ACID, BORIC.—Commercial granulated, £27 per ton; crystal, £28; powdered, £29; in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, in 1-cwt. bags, £28; powdered, in 1-cwt. bags, £29.
ACID, CHROMIC.—9½d. per lb., less 2½%; d/d U.K.
ACID, CITRIC.—1s. per lb. MANCHESTER: 1s. SCOTLAND: B.P. crystals, 1s. per lb., less 5%.
ACID, FORMIC.—85%, in carboys, ton lots, £42 to £47 per ton.
ACID, HYDROCHLORIC.—Spot, 5s. to 7s. 6d. carboy d/d according to purity, strength and locality.
ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50: pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50% by vol., £41. One-ton lots ex works, barrels free.
ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works.
ACID, OXALIC.—£48 15s. to £57 10s. per ton, according to packages and position. GLASGOW: £2 9s. per cwt. in casks. MANCHESTER: £49 to £54 per ton ex store.
ACID, SULPHURIC.—168° Tw., £4 5s. to £4 15s. per ton; 140° Tw., arsenic-free, £2 15s. to £3 5s.; 140° Tw., arsenious, £2 10s.
ACID, TARTARIC.—1s. 1½d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 0½d. per lb.
ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 7s. 6d. per ton; lump, £9 17s. 6d.
ALUMINIUM SULPHATE.—£7 per ton d/d Lancs.; GLASGOW: £7 to £8 ex store.
AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.
AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.
AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.
AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.
AMMONIUM CHLORIDE.—LONDON: Fine white crystals, £16 10s. (See also Salammuniac.)
AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammuniac.)
ANTIMONY OXIDE.—£55 10s. per ton.
ARSENIC.—LONDON: £13 10s. per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND: White powdered, £17 ex store. MANCHESTER: White powdered Cornish, £18, ex store.
BARIUM CHLORIDE.—£10 per ton. GLASGOW: £11 5s. per ton.
BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.
BLEACHING POWDER.—Spot, 35/37%, £8 15s. per ton in casks, special terms for contracts. SCOTLAND: £9.
BORAX COMMERCIAL.—Granulated, £14 10s. per ton; crystal £15 10s.; powdered, £16; packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £14 10s. per ton in 1-cwt. bags, carriage paid.
CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums. GLASGOW: 70/75% solid, £5 10s. per ton net ex store.
CHROMETAN.—Crystals, 2½d. per lb.; liquor, £19 10s. per ton d/d
CREAM OF TARTAR.—£3 19s. per cwt. less 2½%. GLASGOW: £4 4s. net.
FORMALDEHYDE.—£22 10s. per ton.
GLYCERINE.—Chemically pure, double distilled, 1.260 s.g., in tins, £5 7s. 6d. to £6 7s. 6d. per cwt. according to quantity; in drums, £5 to £5 13s. 6d.

IODINE.—Resublimed B.P., 5s. 1d. per lb.
LEAD ACETATE.—LONDON: White, £35 10s. per ton; brown, £35.
GLASGOW: White crystals, £34 to £35; brown, £1 per ton less. MANCHESTER: White, £38; brown, £37.
LEAD NITRATE.—£39 per ton.
LEAD, RED.—SCOTLAND: £46 10s. per ton less 2½%, carriage paid, for 2-ton lots.
LEAD (WHITE SUGAR OF).—GLASGOW: £37 per ton net, ex store.
LITHARGE.—SCOTLAND: Ground, £46 10s. per ton, less 2½%, carriage paid for 2-ton lots.
MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.
MAGNESIUM CHLORIDE.—SCOTLAND: £7 10s. per ton.
MAGNESIUM SULPHATE.—Commercial, £5 per ton, ex wharf.
MERCURY.—Ammoniated B.P. (white precip.), lump, 5s. 11d. per lb.; powder B.P., 6s. 1d.; bichloride B.P. (corros. sub.) 5s. 2d.; powder B.P. 4s. 10d.; chloride B.P. (calomel), 5s. 11d.; red oxide cryst. (red precip.), 7s.; levig. 6s. 6d.; yellow oxide B.P. 6s. 4d.; persulphate white B.P.C., 6s. 1d.; sulphide black (hyd. sulph. cum sulph. 50%), 6s. For quantities under 112 lb., 1d. extra.
METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.
PARAFFIN WAX.—SCOTLAND: 3½d. per lb.
PHENOL.—6½d. to 7½d. per lb.
POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £39.
POTASSIUM BICHROMATE.—SCOTLAND: 5d. per lb., less 5%, carriage paid.
POTASSIUM CHLORATE.—£36 7s. 6d. per ton. GLASGOW: 4½d. per lb. MANCHESTER: £38 per ton.
POTASSIUM IODIDE.—B.P. 4s. 3d. per lb.
POTASSIUM NITRATE.—£27 per ton. GLASGOW: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.
POTASSIUM PERMANGANATE.—LONDON: 9½d. per lb. SCOTLAND: B.P. Crystals, 9½d. MANCHESTER: B.P. 10½d. to 1s.
POTASSIUM PRUSSATE.—6½d. per lb. SCOTLAND: 7d. net, in casks, ex store. MANCHESTER: Yellow, 6½d. to 6¾d.
SALAMMUNIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels. GLASGOW: Large crystals, in casks, £38.
SALT CAKE.—Unground, spot, £3 16s. 6d. per ton.
SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r. in bags.
SODA, CAUSTIC.—Solid, 76/77° spot, £12 10s. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less.
SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.
SODIUM ACETATE.—£18 per ton carriage paid North. GLASGOW: £18 10s. per ton net ex store.
SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. GLASGOW: £12 15s. per ton in 1 cwt. kegs, £11 per ton in 2-cwt. bags. MANCHESTER: £10 10s.
SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount 5%. MANCHESTER: 4d. per lb. GLASGOW: 4d., less 5% carriage paid.
SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.
SODIUM CARBONATE, MONOHYDRATE.—£15 per ton d/d in minimum ton lots in 2 cwt. free bags.
SODIUM CHLORATE.—£26 10s. to £30 per ton. GLASGOW: £1 10s. per cwt.
SODIUM CHROMATE.—4d. per lb. d/d U.K.

SODIUM HYPOSULPHATE.—Commercial, 2 ton lots d/d, £10 5s. per ton; photographic, £14 5s. MANCHESTER: Commercial, £10; photographic, £14 10s.
SODIUM METASILICATE.—£14 per ton, d/d U.K. in cwt. bags.
SODIUM NITRATE.—Refined, £7 15s. per ton for 6-ton lots d/d.
SODIUM NITRITE.—£18 5s. per ton for ton lots.
SODIUM PERBORATE.—10%, ½d. per lb. d/d in 1-cwt. drums.
SODIUM PHOSPHATE.—£13 per ton.
SODIUM PRUSSIAN.—4d. per lb. for ton lots. GLASGOW: 5d. to 5½d. ex store. MANCHESTER: 4½d. to 4½d.
SODIUM SILICATE.—£9 10s. per ton.
SODIUM SULPHATE (GLAUBER SALTS).—£3 per ton d/d.
SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 5s.
SODIUM SULPHIDE.—Solid 60/62%, Spot, £11 5s. per ton d/d in drums; crystals 30/32%, £8 15s. per ton d/d in casks. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8.
SODIUM SULPHITE.—Pea crystals, spot, £13 5s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.
SULPHATE OF COPPER.—£20 per ton, less 2%, in casks. MANCHESTER: £25 10s. per ton f.o.b. SCOTLAND: £26 10s. per ton less 5%, Liverpool, in casks.
SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.
ZINC SULPHATE.—Crystals, £9 per ton, f.o.r., in bags.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 6½d. to 1s. 1d. per lb., according to quality. Crimson, 1s. 5½d. to 1s. 7d. per lb., according to quality.
ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.
BARYTES.—£6 to £7 10s. per ton, according to quality.
CADMIUM SULPHIDE.—6s. to 6s. 3d. per lb.
CARBON BISULPHIDE.—£31 to £33 per ton, according to quantity, drums extra.
CARBON BLACK.—3 11/16d. to 4 13/16d. per lb., ex wharf.
CARBON TETRACHLORIDE.—£41 to £46 per ton, according to quantity, drums extra.
CHROMIUM OXIDE.—Green, 1s. 2d. per lb.
DIPHENYLGUANIDINE.—2s. 2d. per lb.
INDIA-RUBBER SUBSTITUTES.—White, 4½d. to 5d. per lb.; dark, 3½d. to 4½d. per lb.
LAMP BLACK.—£22 to £23 per ton d/d London; vegetable black, £28 to £48.
LEAD HYPOSULPHITE.—9d. per lb.
LITHOPONE.—30%, £16 10s. to £17 5s. per ton.
SULPHUR.—£9 to £9 5s. per ton. SULPHUR PRECIP. B.P., £55 to £60 per ton. SULPHUR PRECIP. COMM., £50 to £55 per ton.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quantity.
VERMILION.—Pale, or deep, 5s. 3d. per lb., 1-cwt. lots.
ZINC SULPHIDE.—10d. to 11d. per lb., according to quality.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—Neutral quality, basis 20.6 per cent. nitrogen, delivered in 6-ton lots to farmer's nearest station, March to June, £7 5s. per ton.
CALCIUM CYANAMIDE.—March, £7 3s. 9d. per ton; April to June, £7 5s. per ton, carriage paid to any railway station in Great Britain in lots of four tons and over.
NITRO-CHALK.—£7 5s. per ton for delivery to end of June.
NITRATE OF SODA.—£7 12s. 6d. per ton for delivery up to end of June.
AMMONIUM PHOSPHATE FERTILISERS.—£10 5s. to £13 15s. per ton for delivery up to end of June, delivered in 6-ton lots to farmer's nearest station.

Coal Tar Products

ACID, CRESYLIC.—97/99%, 4s. 6d. to 4s. 7d. per gal.; 99/100%, 4s. 10d. to 5s. 2d., according to specification; pale 99%, 4s. 8d. to 4s. 9d.; dark, 3s. 10d. to 4s. GLASGOW: Pale, 99/100%, 4s. 3d. to 4s. 9d. per gal.; pale 97/99%, 4s. to 4s. 3d., dark, 97/99%, 3s. 6d. to 3s. 10d.; high boiling acids, 2s. 4d. to 2s. 8d. American specification, 3s. 6d. to 4s. MANCHESTER: Pale, 99/100%, 4s. 8d.
ACID, CARBOLIC.—Crystals, 6½d. to 7½d. per lb.; crude, 60's, 3s. 2d. to 3s. 6d. per gal. MANCHESTER: Crystals, 7½d. per lb.; crude 3s. 4d. per gal. GLASGOW: Crude, 60's, 3s. 2d. to 3s. 8d. per gal.; distilled, 60's, 3s. 8d. to 4s.
BENZOL.—At works, crude, 9½d. to 10d. per gal.; standard motor 1s. 3d. to 1s. 3½d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 8d. to 1s. 8½d. LONDON: Motor, 1s. 3½d. GLASGOW: Crude, 9½d. to 10½d. per gal.; motor, 1s. 4d. to 1s. 5d.
CREOSOTE.—B.S.I. Specification standard, 5½d. to 6d. per gal. f.o.r. Home, 3½d. d/d. LONDON: 4½d. f.o.r. North: 5d. LONDON. MANCHESTER: 5½d. to 6d. GLASGOW: B.S.I. Specification 5½d. to 6d. per gal.; washed oil, 5d. to 5½d.; lower sp. gr. oils, 5d. to 5½d.
NAPHTHA.—Solvent, 90/160%, 1s. 7d. to 1s. 8d. per gal.; 95/160%, 1s. 7d. to 1s. 8d.; 90/190%, 1s. 2d. to 1s. 3d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. GLASGOW: Crude, 6d. to 6½d. per gal.; 90% 160, 1s. 6d. to 1s. 7d. 90% 190, 1s. 1d. to 1s. 2d.

NAPHTHALENE.—Crude, whizzed or hot pressed, £12 to £13 per ton; purified crystals, £18 to £20 per ton in 2-cwt. bags. LONDON: Fire lighter quality, £5 to £5 10s. per ton; crystals, £27 to £27 10s. GLASGOW: Fire lighter, crude, £6 to £7 per ton (bags free). MANCHESTER: Refined £24 per ton f.o.b.
PYRIDINE.—90/140%, 8s. 6d. to 9s. 6d. per gal.; 90/180, 2s. 6d. to 3s. GLASGOW: 90% 140, 9s. to 10s. per gal.; 90% 160, 7s. to 8s.; 90% 180, 2s. 6d.
TOLUOLE.—90%, 2s. per gal.; pure, 2s. 5d. GLASGOW: 90%, 120, 1s. 10d. to 1s. 11d. per gal.
PITCH.—Medium, soft, 36s. to 37s. per ton, in bulk at makers' works. MANCHESTER: 35s. f.o.b., East Coast. GLASGOW: f.o.b. Glasgow, 28s. 6d. to 35s. per ton; in bulk for home trade, 32s. 6d.
XYLOL.—Commercial, 2s. 2d. per gal.; pure, 2s. 4d. GLASGOW: Commercial, 1s. 11d. to 2s. per gal.

Wood Distillation Products

ACETATE OF LIME.—Brown, £8 10s. to £9 per ton; grey, £10 10s. to £11 10s. Liquor, brown, 30° Tw., 6d. to 8d. per gal. MANCHESTER: Brown, £9 10s.; grey, £11 10s.
CHARCOAL.—£5 15s. to £11 per ton, according to grade and locality.
METHYL ACETONE.—40-50%, £42 to £45 per ton.
WOOD CREOSOTE.—Unrefined 6d. to 1s. 6d. per gal., according to boiling range.
WOOD, NAPHTHA, MISCIBLE.—2s. 9d. to 3s. 3d. per gal.; solvent, 3s. 6d. to 3s. 9d. per gal.
WOOD TAR.—£2 10s. to £4 per ton.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex toluol).—1s. 9½d. per lb. d/d buyer's works.
ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.
ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.
ACID NAPHTHIONIC.—1s. 8d. per lb.
ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100%.
ACID, SULPHANILIC.—Spot, 8d. per lb. 100%, d/d buyer's works.
ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
BENZIDINE, HCl.—2s. 5d. per lb., 100% as base, in casks.
m-CRESOL 98/100%.—1s. 8d. to 1s. 9d. per lb. in ton lots.
m-CRESOL 30/31° C.—6½d. to 7½d. per lb. in 1-ton lots.
p-CRESOL 34-5° C.—1s. 7d. to 1s. 8d. per lb. in ton lots.
DICHLORANILINE.—2s. 3d. per lb.
DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.
DINITROBENZENE.—7½d. per lb.
DINITROCHLOROBENZENE, SOLID.—£72 per ton.
DINITROTOLUENE.—48/50° C., 8½d. per lb.; 66/68° C., 10d.
DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.
α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.
β-NAPHTHOL.—In bags, £88 15s. per ton; in casks, £89 15s.
α-NAPHTHYLAMINE.—Lumps, 1s. per lb.; ground, 1s. 0½d. in casks.
β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works in casks.
o-NITRANILINE.—3s. 11d. per lb.
m-NITRANILINE.—Spot, 2s. 7d. per lb., d/d buyer's works.
p-NITRANILINE.—Spot, 1s. 8d. to 2s. 1d. per lb. d/d buyer's works.
NITROBENZENE.—Spot, 4½d. to 5d. per lb., in 90-gal. drums, drums extra. 1-ton lots d/d buyer's works.
NITRONAPHTHALENE.—9d. per lb.; P.G., 1s. 0½d. per lb.
SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb., 100% d/d buyer's works.
o-TOLUIDINE.—10½d. per lb., in 8/10-cwt. drums, drums extra.
p-TOLUIDINE.—1s. 10½d. per lb., in casks.
m-XYLIDINE ACETATE.—4s. 3d. per lb., 100%.

Latest Oil Prices

LONDON, March 24.—LINSEED OIL was easy. Spot, £31 5s. per ton (small quantities); April, £28 15s.; May-Aug., £29 2s. 6d.; Sept.-Dec., £29 10s., naked. SOYA BEAN OIL was steady. Oriental (bulk), afloat, Rotterdam, £28 10s. per ton. RAPE OIL was quiet. Crude, extracted, £35 10s. per ton; technical, refined, £36 10s., naked, ex wharf. COTTON OIL was steady. Egyptian crude, £29 10s. per ton; refined, common edible, £33 10s.; deodorised, £35 10s., naked, ex mill (small lots, £1 10s. extra). TURPENTINE was quiet. American, spot, 40s. 3d. per cwt.
HULL.—LINSEED OIL.—Spot, quoted £29 7s. 6d. per ton; March and April, £29; May-Aug., £29 2s. 6d.; Sept.-Dec., £29 7s. 6d. COTTON OIL.—Egyptian, crude, spot, £30 10s. per ton; edible, refined, spot, £33 5s.; technical, spot, £33 5s.; deodorised, £35 5s., naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £34 per ton, naked. GROUNDNUT OIL.—Extracted, spot, £33 per ton; deodorised, £36. RAPE OIL.—Extracted, spot, £34 10s. per ton; refined, £35 10s. SOYA OIL.—Extracted, spot, £32 10s. per ton; deodorised, £35 10s. COD OIL.—F.o.r. or f.a.s., 27s. 6d. per cwt. in barrels. CASTOR OIL.—Pharmaceutical, 45s. 6d. per cwt.; first, 40s. 6d.; second, 38s. 6d. TURPENTINE.—American, spot, 42s. 3d. per cwt.

Inventions in the Chemical Industry

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Specifications Open to Public Inspection

MANUFACTURE AND PRODUCTION OF ARTIFICIAL FIBRES.—Coutts and Co., and F. Johnson (Legal representatives of J. Y. Johnson (deceased)). (I. G. Farbenindustrie). July 15, 1935. 461,666.
 DYE STUFFS SUITABLE FOR SENSITISING PHOTOGRAPHIC SILVER HALIDE EMULSIONS.—J. D. Kendall. Aug. 16, 1935. 461,688.
 MANUFACTURE OF UNSATURATED ALCOHOLS OR THEIR DERIVATIVES.—W. W. Groves. Sept. 4, 1935. 16969/36.
 STABILISED PETROLEUM HYDROCARBONS AND METHOD OF PREPARING THE SAME.—Wingfoot Corporation. Sept. 6, 1935. 22140/36.
 SYNTHETIC MOULDING MATERIALS.—Bakelite, Ltd. Sept. 3, 1935. 23454/36.
 MANUFACTURE OF REDUCTO-DE-HYDROCHLORIC ACID.—I. G. Farbenindustrie. Sept. 4, 1935. 24145/36.
 PROCESS FOR THE PRODUCTION OF UNALTERABLE COLOURED PIGMENTS CONTAINING ZIRCONIUM DIOXIDE.—L. Passerini. Sept. 3, 1935. 24151/36.
 SEPARATION OF THE OIL FROM FOREIGN MATTER IN CRUDE-OIL EMULSIONS.—H. Passler, and A. Brunnbauer. Sept. 5, 1935. 24254/36.
 MANUFACTURE OF AZO DYE STUFFS.—Soc. of Chemical Industry in Basle. Sept. 7, 1935. 24377/36.
 MANUFACTURE OF PIGMENT DYE STUFFS.—I. G. Farbenindustrie. Sept. 6, 1935. 24407/36.

Specifications Accepted with Date of Application

MANUFACTURE OF CELLULOSE DERIVATIVES AND OF ARTIFICIAL FILAMENTS, FILMS, AND OTHER SHAPED STRUCTURES THEREFROM.—Dr. L. Lilienfeld. May 29, 1935. 462,283.
 TREATMENT OF DRYING OR SEMI-DRYING OILS SUCH AS LINSEED OIL, TO OBTAIN RESIN-LIKE PRODUCTS.—Congoleum-Nairn, Inc. June 30, 1934. 462,048.
 PRODUCTION OF BITUMINOUS EMULSIONS.—J. A. Montgomerie, and P. K. Archibald. July 2, 1935. 462,111.
 MANUFACTURE OF POLYMERISATION PRODUCTS.—I. G. Farbenindustrie. July 26, 1934. (Samples furnished.) 462,165.
 MANUFACTURE OF CASEIN PRODUCTS.—Albright and Wilson, Ltd. Sept. 28, 1934. 462,114.
 MANUFACTURE AND PRODUCTION OF POLYAMINO-1.9-ANTHRAPYRIMIDINES.—I. G. Farbenindustrie and G. W. Johnson. July 29, 1935. 462,227.
 PROCESS FOR THE MANUFACTURE OF COMPOUNDS of the type of crotylidene cyanacetic acid (2-cyan-2.4-hexadiene-acid-1).—A. Carpmal (I. G. Farbenindustrie). Aug. 3, 1935. 462,169.
 COLOURING FOODSTUFFS.—G. W. Johnson (I. G. Farbenindustrie). Aug. 24, 1935. 462,170.
 MANUFACTURE OF AZO DYE STUFFS.—W. W. Groves (J. R. Geigy A.-G.). Aug. 27, 1935. 462,233.
 MANUFACTURE OF AZO DYE STUFFS.—A. H. Knight and Imperial Chemical Industries, Ltd. Aug. 30, 1935. 462,176.
 MANUFACTURE AND PRODUCTION OF IMINOPOLYMETHINE DYE STUFFS.—G. W. Johnson (I. G. Farbenindustrie). Aug. 28, 1935. 462,238.
 MANUFACTURE AND PRODUCTION OF IMINO-POLYMETHINE DYE STUFFS.—G. W. Johnson (I. G. Farbenindustrie). Aug. 28, 1935. 462,206.
 MANUFACTURE AND PRODUCTION OF PHTHALOCYANINE DYE STUFFS.—G. W. Johnson (I. G. Farbenindustrie). Aug. 29, 1935. 462,239.
 MANUFACTURE AND PRODUCTION OF GRANULAR FERTILISERS.—G. W. Johnson (I. G. Farbenindustrie). Sept. 2, 1935. 462,244.
 MANUFACTURE OF HYDROFLUORIC ACID.—E. I. du Pont de Nemours and Co., and J. C. Lawrence. Sept. 2, 1935. 462,131.
 MANUFACTURE AND PRODUCTION OF UNSATURATED ALIPHATIC CARBOXYLIC ACID NITRILES.—I. G. Farbenindustrie. Sept. 4, 1934. 462,181.
 MANUFACTURE, PRODUCTION, AND RECOVERY OF AMMONIUM CHLORIDE AND SODIUM BICARBONATE.—G. W. Johnson (I. G. Farbenindustrie). Sept. 3, 1935. 462,132.
 PROCESS FOR THE MANUFACTURE OF ISOCYANATES.—A. Carpmal (I. G. Farbenindustrie). Sept. 3, 1935. 462,182.
 MANUFACTURE OF PAPER.—P. T. Gale, F. Hamilton, R. J. W. Reynolds, and Imperial Chemical Industries, Ltd. Sept. 4, 1935. 462,254.
 APPARATUS FOR MEASURING AND REGISTERING THE DENSITY OF GASES.—G. W. Johnson (I. G. Farbenindustrie). Sept. 5, 1935. 462,311.
 MANUFACTURE OF THREADS FROM VISCOSE.—W. W. Groves (I. G. Farbenindustrie). Sept. 5, 1935. 462,184.
 MANUFACTURE OF PARAFORMALDEHYDE.—E. I. du Pont de Nemours and Co., and W. S. Hinegardner. Sept. 6, 1935. 462,319.
 DYEING OF CELLULOSE ESTERS WITH AZO DYE STUFFS.—A. Carpmal (I. G. Farbenindustrie). Sept. 10, 1935. 462,335.
 COLOURATION OF TEXTILE AND OTHER MATERIALS.—British Celanese Ltd., and P. F. C. Sowter. July 25, 1935. (Divided out of 21131/35.) 462,222.
 MANUFACTURE OF 2:6-DIMETHYLNAPHTHALENE-7-SULPHONIC ACID.—W. W. Groves (I. G. Farbenindustrie). Sept. 12, 1935. 462,337.
 PRODUCTION OF WATER ENRICHED WITH HEAVY WATER.—F. Hansgirtg. Dec. 6, 1934. 462,191.
 DEHYDROGENATION OF SATURATED HYDROCARBONS.—Usines de Melle. Dec. 27, 1934. 462,349.
 MANUFACTURE OF WETTING, WASHING, DISPERSING, AND LIKE AGENTS.—E. A. Mauersberger. Jan. 15, 1936. 462,202.
 MANUFACTURE OF HYDRATED TITANIUM COMPOUNDS.—Titanium Pigment Co. Feb. 2, 1935. 462,206.
 MANUFACTURE OF KETONES OF THE PYRENE SERIES.—Soc. of Chemical Industry in Basle. Feb. 4, 1935. 462,209.
 PROCESS FOR PRODUCING CITRIC ACID.—J. Zender. April 4, 1935. 462,350.

Applications for Patents

DETERMINING QUANTITIES OF GASES IN MIXTURES.—Imperial Chemical Industries, Ltd., C. H. Bosanquet, F. W. Haywood, and J. L. Pearson. 5891.
 MANUFACTURE OF NEW RESINOUS CONDENSATION PRODUCTS.—I. G. Farbenindustrie. (Germany, Feb. 19.) (Cognate with 6056.) 6058.
 OXIDATION OF CHROMIUM SULPHATE TO CHROMIC ACID.—G. W. Johnson (I. G. Farbenindustrie.) 5883.
 MANUFACTURE OF COMPOUNDS OF PERYLENE SERIES.—G. W. Johnson (I. G. Farbenindustrie.) 5884.
 MANUFACTURE OF AZO DYE STUFFS.—G. W. Johnson (I. G. Farbenindustrie.) 6136.
 MANUFACTURE AND PRODUCTION OF ACETYLENE.—G. W. Johnson (I. G. Farbenindustrie.) 6369.
 MANUFACTURE, ETC., OF UNSATURATED HYDROCARBONS.—G. W. Johnson (I. G. Farbenindustrie.) 6370.
 SPLITTING UP GAS MIXTURES CONTAINING ACETYLENE.—G. W. Johnson (I. G. Farbenindustrie.) 6371.
 MANUFACTURE OF ACETYLENE by thermal, etc., treatment of hydrocarbons.—G. W. Johnson (I. G. Farbenindustrie.) 6372.
 PRODUCTION OF AQUEOUS SOLUTIONS OF PHENOLS difficultly soluble in water.—F. Koenigsberger. 6360.
 HORMONES.—F. Koenigsberger. 6361.
 GAS FOR DEFENCE PURPOSES.—R. J. M. McKerrell. 5664.
 CATALYTIC PYROLYSIS OF HYDROCARBONS.—A. L. Mond (Universal Oil Products Co.). 5637.
 PRODUCTION OF VALUABLE LIQUID HYDROCARBONS.—A. L. Mond (Universal Oil Products Co.). 5732.
 MANUFACTURE OF GUANIDINE DERIVATIVES.—Montecatini Soc. Generale per l'Industria Mineraria ed Agricola. (Italy, Feb. 29, '36.) 6091.
 MANUFACTURE OF FREE SH-GLUTATHIONE.—Schering-Kahlbaum, A.-G. (Germany, March 6, '36.) 6240.
 PRODUCING FATTY ACIDS, ETC., FROM THEIR GLYCERIDES.—Albert Products, Ltd. (Germany, April 22, '36.) 6807.
 DRYING-OIL COMPOSITIONS.—Bakelite, Ltd. (United States, April 25, '36.) 6408.
 MANUFACTURE OF PARTIALLY ESTERIFIED COMPOUNDS OF DIHYDRO-OSTRIN SERIES.—A. G. Bloxam (Soc. of Chemical Industry in Basle). 7049.
 MANUFACTURE OF WATER-SOLUBLE AZO DYE STUFFS.—A. Carpmal (I. G. Farbenindustrie.) 6614.
 MANUFACTURE OF SULPHONIC ACID AMIDE COMPOUNDS.—A. Carpmal (I. G. Farbenindustrie.) 6947.
 MANUFACTURE OF SULPHUR DYE STUFFS.—A. Carpmal (I. G. Farbenindustrie.) 7067.
 PRODUCTION OF CITRIC ACID.—Chauncey Chemical Corporation. (United States, March 20, '36.) 6633.
 PREPARATION OF ETHERIFIED DERIVATIVES OF PENTAHYDROXY-FUCHSONE.—Dr. Kereszty and Dr. Wolf, Chinoin Gyogyszer es Vegyeszeti Termekek Gyara Reszvenytarsasag. (Hungary, May 18, '36.) 6968.
 PREPARATION OF NITRO AND AMINO DERIVATIVES, ETC.—Compagnie Nationale de Matieres Colorantes et Manufactures de Produits Chimiques du Nord Reunies Etablissements Kuhlmann. 6517, 6518.
 MANUFACTURE OF MONOAZO DYE STUFFS.—J. R. Geigy, A.-G. (Switzerland, March 5, '36.) 6453.
 MANUFACTURE OF DISAZO-DYE STUFFS.—J. R. Geigy, A.-G. (Germany, April 29, '36.)
 MANUFACTURE OF COLOURED LACQUERS AND COATING COMPOSITIONS.—J. R. Geigy, A.-G., and W. W. Groves. 7047.
 MANUFACTURE OF ALUMINIUM SALTS OF CARBOXYLIC ACIDS.—W. W. Groves (A.-G. fur Stickstoffdunger). 6711.
 MANUFACTURE OF CYCLOPENTANE-HYDROPHENANTHRENE KETONES.—W. W. Groves. 6779.
 MANUFACTURE OF DERIVATIVES OF CYCLOPENTANE-POLYHYDRO-PHENANTHRENE.—W. W. Groves. 6780.

MANUFACTURE OF VAT DYESTUFFS.—I. G. Farbenindustrie. (Germany, March 4, '36.) 6463.

MANUFACTURE OF DI-(β -CHLORO- α - OR β -OXYPROPYL)-ARYLAMINES.—I. G. Farbenindustrie. (Germany, April 18, '36.) 6597.

MANUFACTURE OF STIFF FABRICS STABLE TO LAUNDERING.—I. G. Farbenindustrie. (Germany, March 6, '36.) 6776.

MANUFACTURE OF CHROMIFEROUS DYESTUFFS.—I. G. Farbenindustrie. (Germany, March 11, '36.) 7042.

MANUFACTURE OF SODIUM HYDROSULPHIDE.—I. G. Farbenindustrie. (Germany, April 23, '36.) 7046.

MANUFACTURE OF SYNTHETIC LUBRICATING-OILS.—Imperial Chemical Industries, Ltd., and A. P. Lowes. 6455.

SYNTHETIC RESINOUS MATERIALS.—Imperial Chemical Industries, Ltd., and A. Hill. 6981.

TREATMENT OF FIBROUS SOLIDS WITH GASES.—Imperial Chemical Industries, Ltd. 6984.

PRODUCTION OF WHITE RESIST STYLES IN TEXTILE PRINTING.—Imperial Chemical Industries, Ltd., and D. P. Mulburn. 7115.

PRINTING CELLULOSE TEXTILES.—Imperial Chemical Industries, Ltd., and D. P. Mulburn. 7116.

PREPARATION OF CELLULOSE XANTHATE SOLUTIONS.—L. Mellersh-Jackson. (Brown Co.). 6910.

MANUFACTURE, ETC., OF PHENOLS.—G. W. Johnson (I. G. Farbenindustrie.) 6487.

CATALYTIC POLYMERISATION OF OLEFINS.—G. W. Johnson (I. G. Farbenindustrie.) 6488.

MANUFACTURE, ETC., OF AZO DYESTUFFS.—G. W. Johnson (I. G. Farbenindustrie.) 6489, 6929.

MANUFACTURE, ETC., OF TRIARYLMETHANE DYESTUFFS.—G. W. Johnson (I. G. Farbenindustrie.) 6490.

MANUFACTURE OF PREPARATIONS FOR TEXTILE, ETC., INDUSTRIES.—G. W. Johnson (I. G. Farbenindustrie.) 6491.

MANUFACTURE OF ADDITION COMPOUNDS OF VINYL KETONES.—G. W. Johnson (I. G. Farbenindustrie.) 6827.

DYEING CELLULOSE ESTERS, ETC.—G. W. Johnson (I. G. Farbenindustrie.) 6828.

MANUFACTURE OF COMPOUNDS OF ANTHRAPHYRIDONE SERIES.—G. W. Johnson (I. G. Farbenindustrie.) 6927.

MANUFACTURE OF HALOGENATED PYRIDINE DERIVATIVES.—F. Hoffman-La Roche and Co., A.-G. (Germany, April 25, '36.) 6666.

MANUFACTURE OF ETHYLENE.—G. W. Johnson (I. G. Farbenindustrie.) 6928.

PRODUCTION OF ALIPHATIC CARBOXYLIC ACIDS.—Markische Seifen-Industrie, C. Staennings, and A. Imhausen. (Germany, March 10, '36.) 6985.

CATALYST.—A. L. Mond (Universal Oil Products Co.). (Oct. 17, '35.) 6459.

CHEMICAL SUBSTANCES and artificial compositions containing them.—W. H. Moss. 6484.

LUBRICATING OILS, ETC.—Naamlooze Venootschap de Bataafsche Petroleum Maatschappij. (March 13, '36.) 6631.

BATCH DISTILLATION OF LIQUID MIXTURES.—Naamlooze Venootschap de Bataafsche Petroleum Maatschappij. (Holland, March 12, '36.) 6679.

TREATMENT OF SOLUTIONS OF TITANIUM SULPHATE.—Naamlooze Venootschap Industriële Maatschappij voorheen Noury & van der Lande. (Holland, March 7, '36.) 6831.

TREATMENT OF TITANIUM DIOXIDE, ETC.—Naamlooze Venootschap Industriële Maatschappij voorheen Noury & van der Lande. (Holland, March 7, '36.) 6832.

HYDROCARBON OIL CONVERSION.—Naamlooze Venootschap Nieuwe Oetroot Maatschappij. (United States, April 1, '36.) 6834.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Poland.—An agent established at Warsaw wishes to obtain the representation of United Kingdom manufacturers of heavy and fine chemicals and drugs. (Ref. No. 872.)

New Chemical Trade Marks

Compiled from official sources by Gee and Co., patent and trade mark agents, Staple House, 51 and 52 Chancery Lane, London, W.C.2.

Zolate. 570,606. Chemical substances used in manufactures, photography, or philosophical research, and anti-corrosives. British Zonolite Products, Ltd., Orchard House, 30 Orchard Street, London, W.1. July 29, 1936.

Neosol. 570,266. Mineral dyestuffs. Society of Chemical Industry in Basle. July 15, 1936.

Ovostab. 569,545. Chemical substances used for agricultural, horticultural, veterinary, and sanitary purposes. Boots Pure Drug Co., Ltd., Nottingham, chemists and druggists. June 17, 1936.

Neocot. 570,862. Dyes and colours all included in Class 1. Society of Chemical Industry in Basle. August 12, 1936.

Folosan. 570,217. Fungus destroying or preventing preparations for agricultural purposes. Bayer Products, Ltd., 31 to 34 Basinghall Street, London, E.C.2. July 14, 1936.

Lubrol. 562,024. Mixtures of higher fatty acids, petroleum and ammonia, for use in the oiling of vegetable fibres in the course of manufacture. British Dyestuffs Corporation, Ltd., Imperial Chemical House, Millbank, London, S.W.1. August 6, 1935.

Chemical and Allied Stocks and Shares

ALTHOUGH holiday influences reduced the volume of business on the stock and share markets this week, industrial shares developed a better tendency and were inclined to recover in price. Active shares of chemical and kindred companies benefited from the general trend. Imperial Chemical rallied from 38s. 7½d. to 39s. 3d., and have thus recovered their decline of the previous week. Although the market is still taking the view that the forthcoming results are unlikely to show an increased dividend, it is being pointed out that on the basis of an 8 per cent. payment the yield offered would appear to be favourable. B. Laporte remained around 122s. 6d., and continue to be held firmly on hopes of a larger dividend or a possible bonus. Salt Union kept at 40s. and Fison Packard, although more active, were also again 40s. It is being suggested in the market that it is possible the latter company may sooner or later offer shareholders additional shares on favourable or bonus terms if the offer made to acquire shares in Anglo-Continental Guano Works is effective.

Boots Pure Drug recovered to 54s. 6d. the lower price made recently having attracted buyers. It is generally assumed the company has again had a prosperous experience in the financial year ending this month, and the current belief is that the dividend and cash bonus distributions will be at least maintained. In view of the strong balance sheet and large reserves, a scrip bonus could be forthcoming at any time, but the market now seems less inclined to look for an early development of this kind. Sangers and Timothy Whites and Taylors were steady.

Turner and Newall were better at 104s. 3d., and British Oxygen attracted more attention around 120s. Metal Industries were active, partly on account of the company's considerable holding of British Oxygen shares. Amalgamated Metal Corporation shares have remained rather lower in price, the increase in dividend not being up to market estimates. There was buying

of Metal Traders at higher prices on attention drawn to the large yield offered by the shares. Babcock and Wilcox were higher on the possibility of an increased dividend despite the conservative policy invariably followed by the directors. Hopkinsons were bought on the 10 per cent. dividend which was up to best market anticipations. Richard Thomas were better at 14s. 4½d., on continued hopes that the dividend on these 6s. 8d. shares may be brought up to 15 per cent. for the year ending this month. In respect of the next financial period a considerably larger capital will rank for dividend, but judging from the statements made at the meeting earlier this year, favourable expansion in earning capacity is likely. Associated Portland Cement and other cement shares were rather dull, having been affected by the statements at the recent meeting of British Portland Cement, where attention was drawn to the increased costs that have to be faced by cement manufacturers owing to the rise in the price of coal.

British Aluminium have not benefited from the increased dividend of 10 per cent. and the large expansion in the past year's profits, the disposition being to await the statements at the meeting for news as to whether it is intended to make any early issue of the shares which it is proposed to create. If so the market is hopeful they may be offered to shareholders on favourable terms.

Unilever have made the higher price of 42s. 9d., and Lever Brothers' preference shares were firm, aided by the favourable results announced by Joseph Crosfield and other subsidiaries. British Oil and Cake Mills preferred ordinary were higher at 47. United Premier Oil and Cake were firm at 10s. 7½d., aided by the larger dividend. General Refractories were little changed at 30s. 9d., despite the increased payment for the past year. Many market men had not been looking for more than the maintenance of the dividend at 15 per cent. in view of the larger capital ranking.

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